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# REGION 5 RAC2

## REMEDIAL ACTION CONTRACT FOR

Remedial, Enforcement Oversight, and  
Non-Time Critical Removal Activities at Sites of Release  
or Threatened Release of Hazardous Substances in Region 5

### FINAL REMEDIAL ACTION REPORT

OMC Plant 2 Site (OU4)

In Situ Soil Mixing Remedy

Waukegan, Illinois

WA No. 151-RARA-0528/Contract No. EP-S5-06-01

September 2012

PREPARED FOR

U.S. Environmental Protection Agency



PREPARED BY

**CH2M HILL**

Ecology and Environment, Inc.

Environmental Design International, Inc.

Teska Associates, Inc.

Critigen, LLC

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*Remedial Action Report*

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**CH2MHILL®**

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# Acronyms and Abbreviations

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bgs	below ground surface
CLP	Contract Laboratory Program
COC	chemical of concern
DCE	dichloroethene
DPT	direct push technology
DNAPL	dense nonaqueous phase liquid
EFS	Environmental Field Services, Inc
EJ&E	Elgin, Joliet & Eastern
ELCR	excess lifetime cancer risk
FS	feasibility study
ft <sup>2</sup>	square feet
GSI	Geo-Solutions Inc.
HI	hazard index
ISSM	in situ soil mixing
lbs/ft <sup>3</sup>	pounds per cubic foot
MCL	maximum contaminant level
µg/L	micrograms per liter
OMC	Outboard Marine Corporation, Inc.
OU	operable unit
ppm	parts per million
PID	photoionization detector
PCB	polychlorinated biphenyl
RA	remedial action
RAC	remedial action contract
RAO	remedial action objective
ROD	Record of Decision
TCE	trichloroethene
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WA	work assignment
yd <sup>3</sup>	cubic yards
ZVI	zero-valent iron

# Introduction

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This report documents the remedial action (RA) activities conducted for the U.S. Environmental Protection Agency (USEPA) at the Outboard Marine Corporation, Inc. (OMC) Plant 2 Site in Waukegan, Illinois. The Plant 2 Site has been designated as operable unit (OU) 4 of the OMC Superfund Site.

## 1.1 Purpose

Based on evaluations of the site conditions, potential alternatives and costs, and input from state, local, and federal stakeholders, USEPA selected a remedy for the groundwater and the trichloroethene (TCE) dense nonaqueous phase liquid (DNAPL) that includes the following components:

- Use of soil mixing technology to inject zero-valent iron (ZVI) and bentonite clay to provide in situ treatment and isolation of the TCE DNAPL.
- Performance of periodic injections of a soluble substrate, such as sodium lactate, into the five groundwater source areas to enhance the bioremediation to treat dissolved-phase chlorinated volatile organic compounds. The USEPA later modified the substrate to include sodium permanganate through a letter to file by the Superfund Division Director (dated February 17, 2012).
- Installation of an air sparge curtain to prevent offsite migration of dissolved-phase chlorinated volatile organic compounds.
- Application of monitored natural attenuation and institutional controls to monitor conditions and protect human health and the environment until final cleanup levels are achieved.

The overall strategy, elements, and design criteria to implement the remediation of the TCE DNAPL and the groundwater are presented in the final basis of design report (CH2M HILL 2009) prepared for USEPA under work assignment (WA) No. 053-RARA-0528 (Contract No. EP-S5-06-01).

This report summarizes the construction activities associated with the in situ soil mixing (ISSM) remedy. The activities were completed under WA No. 151-RARA-0528 in 2011 and 2012. The construction of the other components of the groundwater remedial action will be completed under separate WAs.

## 1.2 Project Background

### 1.2.1 Site Location and Description

The OMC Plant 2 Site is a 60-acre industrial property on the lakefront in Waukegan, Illinois (Figure 1-1). The site is bordered by the North Shore Sanitary District to the north, Lake Michigan to the east, Sea Horse Drive and Waukegan Harbor to the south, and Elgin, Joliet & Eastern (EJ&E) railroad tracks to the west (Figure 1-2). The North Ditch drains upland (offsite) areas and runs along the northern site boundary towards Lake Michigan until it turns to the south close to the lake. The lakefront portion of the site is emergent dune land and beachfront. Except for the North Ditch, there are no existing wetlands on the site.

### 1.2.2 Site History

OMC manufactured outboard motors from about 1948 until 2000 in its 1,000,000-square-foot (ft<sup>2</sup>) Plant 2 facility. OMC used hydraulic and lubricating oils containing polychlorinated biphenyls (PCBs) in its production line machinery beginning in 1961 until 1972 and allowed the oils to empty into floor drains that led to either an outfall into former Slip 3 or into the former Crescent Ditch and Oval Lagoon, which fed into the North Ditch. OMC Plant 2 was the source of contamination in Waukegan Harbor (OU1) sediment (through the Slip 3 outfall) and likely a source of PCB contamination in Lake Michigan.

OMC also operated several vapor degreasers at the facility to clean newly made parts with TCE. Leaking degreasers and/or TCE storage tanks have created a widespread TCE groundwater contaminant plume and an isolated DNAPL TCE pool beneath the site.

OMC declared bankruptcy in December 2000 and ceased manufacturing operations in August 2001. The OMC Plant 2 properties were abandoned and put up for sale by the Trustee during the bankruptcy proceedings. The City of Waukegan assumed the title to the OMC Plant 2 property in December 30, 2005, and is responsible for maintaining the building and property, and for operations and maintenance of the PCB containment cells.

### 1.2.3 Recent Removal Actions at the Site

In January 2006, USEPA's Emergency Response Branch began a removal action in the dune area near the East Containment Cell because high levels of PCBs were found in the sands outside the cell. The removal activities included soil excavation and offsite disposal of more than 6,000 cubic yards (yd<sup>3</sup>) of PCB-contaminated soil from 2 areas adjacent to the East Containment Cell and a 150-foot stretch of the South Ditch to a depth of about 2 feet. USEPA also cleaned out several storm sewers leading from the OMC Plant 2 facility to prevent recontamination of the beachfront by residual PCBs discovered in the sewerlines.

Based on the investigation results, the City of Waukegan hired a subcontractor to demolish nearly 400,000 ft<sup>2</sup> of uncontaminated structures down to the concrete slabs beginning in August 2006. In 2008, most of the concrete slabs were demolished and stockpiled on the northern part of the site.

In January 2007, the City of Waukegan and USEPA also removed PCB-containing transformers (except for one that remained on the roof of the building [because of inaccessibility]), and an extensive amount of copper wire and electrical connectors from the plant.

## 1.3 Components of the Remedial Action

USEPA began a remedial investigation at the OMC Plant 2 Site in 2004 to determine the nature and extent of contamination in groundwater, sediment, and soil and within the OMC Plant 2 building. The *Remedial Investigation Report* (CH2M HILL 2006a), including the investigation results and human health and ecological risk assessments, was issued in April 2006. A feasibility study (FS) was conducted in 2005 to examine site cleanup alternatives designed to protect human health and the environment, and the *Feasibility Study Report* (CH2M HILL 2006b) was issued in December 2006.

In January 2007, USEPA issued a proposed plan for the cleanup of the soil, sediment, and the abandoned building. The proposed plan presented the recommended remedy for the soil and sediment impacted by PCBs and polynuclear aromatic hydrocarbons and PCB-impacted building media. Upon review of public comments on the proposed plan, USEPA issued a Record of Decision (ROD) for the media in August 2007 and noted the initiation of pilot tests of in situ remedial technologies for the groundwater and DNAPL. The remedial design for the cleanup of the soil, sediment, and building materials was completed in June 2008.

The RA for the soil, sediment, and building media was initiated under the American Recovery and Reinvestment Act by USEPA's small business remedial action contract (RAC) contractor. The demolition of the building, removal of the building slab and subslab soils, and soil and sediment remediation were substantially completed in August 2011. A third phase of remedial activities, implemented in 2012, addressed contamination in the North Ditch, the Dune Area, and the New Smelter Slab Area. In addition, a supplemental FS report was prepared in July 2012 summarizing the remedial alternatives to address high levels of PCB-contaminated subsurface soils beneath the western portion of the former Plant 2 building that was the Old Die Cast (ODC) area and in the utility corridors along the western and northern property boundaries. A ROD Amendment to address the ODC area and utility corridors is planned for September 2012.

In 2008, USEPA completed the pilot test of in situ groundwater technologies for dissolved volatile organic compounds (VOCs) and a bench-scale study of ZVI for remediation of the TCE DNAPL. The findings of the pilot test and bench-scale study are presented in the *Enhanced In Situ Bioremediation Pilot Study Report* (CH2M HILL 2008a). Based on the results of the pilot test and bench-scale study, the potential alternatives presented in the FS report were

re-examined and the results summarized in the *Supplemental Feasibility Study Report* (CH2M HILL 2008b). USEPA issued a proposed plan for the cleanup of the TCE DNAPL and groundwater in August 2008 and a ROD in February 2009. The results of the testing, technical parameters, and design elements of the DNAPL/groundwater remedy are discussed in the final basis of design report (CH2M HILL 2009).

In 2010 the construction of the air sparge curtain groundwater remedy was initiated with the start of equipment fabrication, preparation of the site, and installation of the 1,000-foot horizontal air sparge well in December. In February 2011 the fabrication of the air sparge equipment was completed, and the system was started up in March 2011. Final inspection of the remedy was completed on September 1, 2011, and the system has been undergoing operation and maintenance since that time.

## 1.4 Remedial Action Objectives and Goals

The remedial action objectives (RAOs) for the groundwater were developed to actively reduce the concentrations of the chemicals of concern (COCs) to levels that would allow the groundwater to be used for residential purposes without restrictions. The RAOs for the TCE DNAPL were developed to actively reduce the concentration of TCE to the maximum extent practicable. The specific RAOs are as follows:

- Remediation of DNAPL and groundwater within the DNAPL area to the extent practicable and minimization of the migration of contaminants in groundwater
- Prevention of residential indoor inhalation of VOCs that causes a calculated hazard index (HI) greater than 1 or an excess lifetime cancer risk (ELCR) greater than an estimated risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$
- Prevention of construction worker exposure to groundwater, through direct contact, ingestion, or inhalation that causes a calculated HI greater than 1 or an ELCR greater than  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$
- Remediation of contamination in groundwater to concentrations below a calculated HI of 1 or an ELCR of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  within a reasonable timeframe

The RAOs are consistent with the reasonably anticipated future land use for the OMC Plant 2 Site. The City of Waukegan has stated its desire to redevelop its lakefront into a high-density residential area. It is anticipated that the RAOs will be achieved through implementation of the remedial actions presented in the ROD, which include a combination of in situ treatment technologies and institutional controls. The performance and effectiveness of the remedy will be evaluated as part of USEPA's statutory 5-year review for the OMC Plant 2 Site. Site cleanup levels for the groundwater and TCE DNAPL, as specified in the ROD, are shown in Table 1-1.

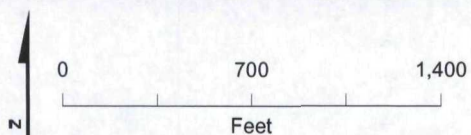
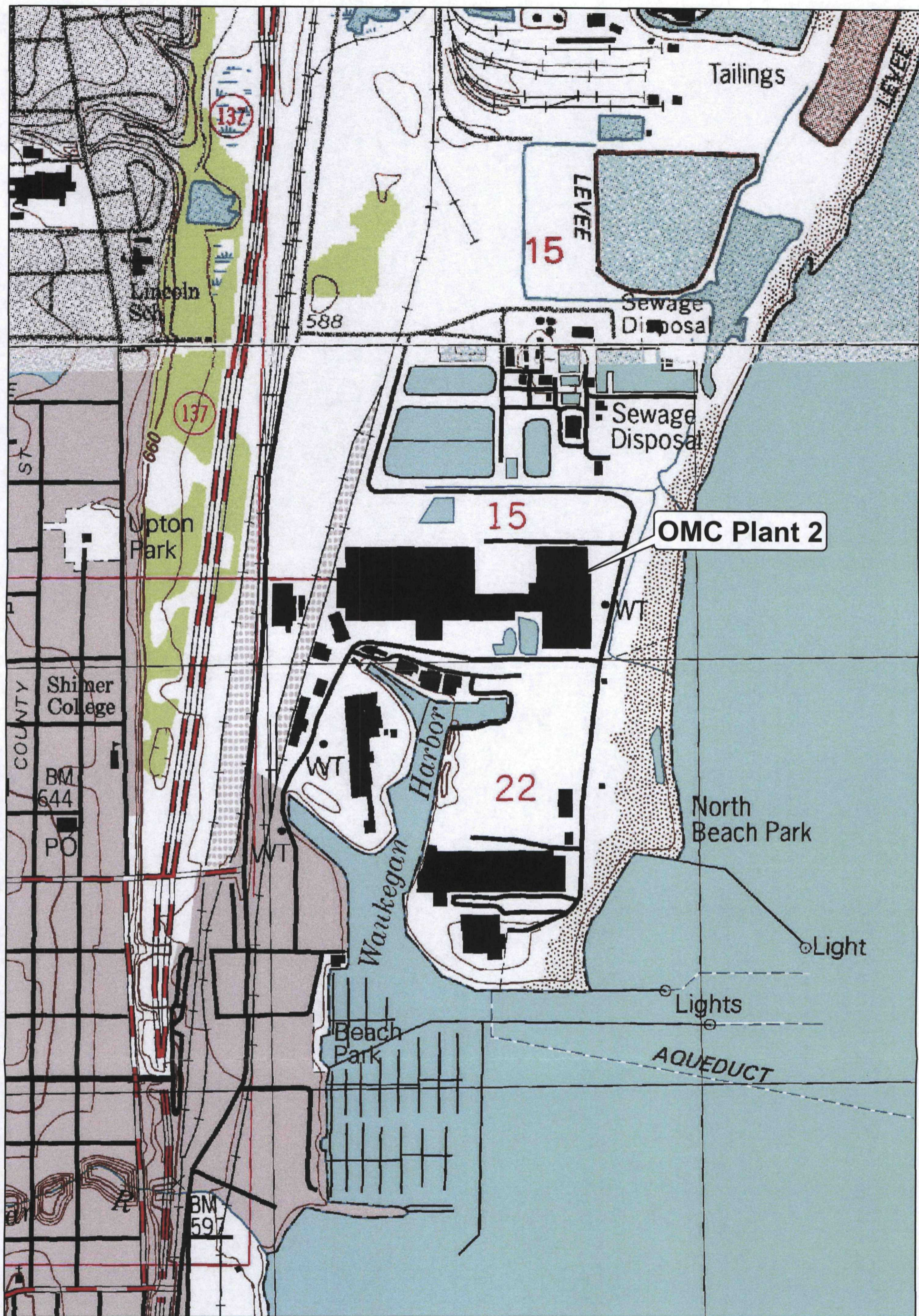
TABLE 1-1  
Site Cleanup Levels for Groundwater  
OMC Plant 2 Site, Waukegan, Illinois

Compound	Media	Cleanup Level (source)	Residual Risk
TCE	Groundwater	5 µg/L (MCL) <sup>a</sup>	ELCR = $3 \times 10^{-6}$
Cis-1,2-DCE	Groundwater	70 µg/L (MCL)	HI = 0.20
Vinyl chloride	Groundwater	2 µg/L (MCL)	ELCR = $4.7 \times 10^{-5}$
Arsenic	Groundwater	10 µg/L (MCL)	ELCR = $2 \times 10^{-4}$
TCE	DNAPL	Maximum Reduction Practicable	--

Note:

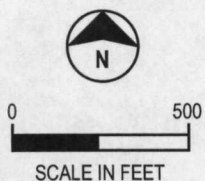
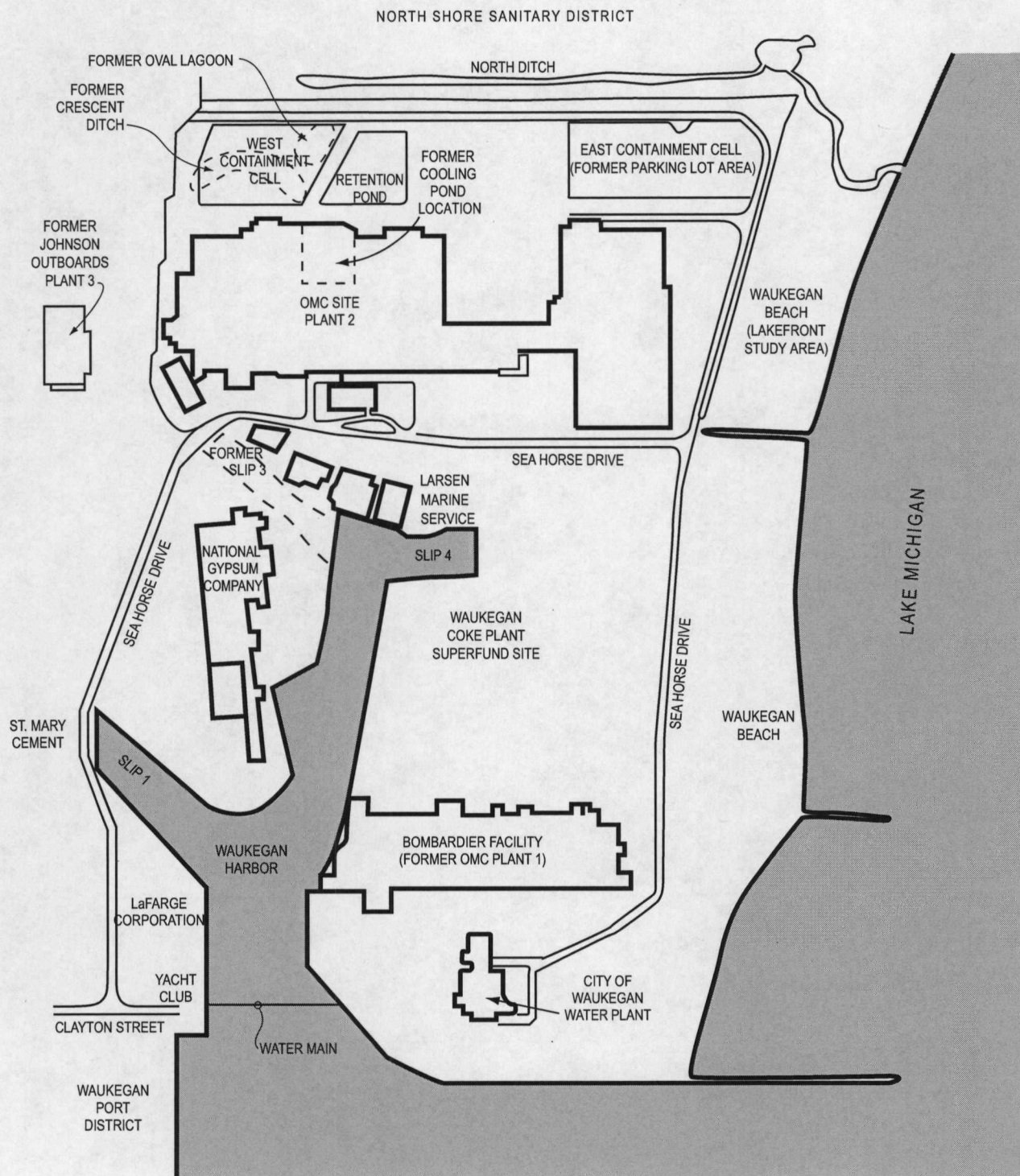
<sup>a</sup> Maximum contaminant level (MCL) under the Safe Drinking Water Act.

TCE = trichloroethene, DCE = dichloroethene, µg/L = micrograms per liter



Source: USGS Waukegan Quadrangle Map

Figure 1-1  
Site Location Map  
OMC Plant 2  
Waukegan, IL



SOURCE: ADAPTED FROM USEPA 2002

Figure 1-2  
**Vicinity Features**  
 OMC Plant 2

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## SECTION 2

# Chronology of Events

Table 2-1 presents a chronological summary of major events and dates associated with the ISSM component of the groundwater remedy.

TABLE 2-1  
**Completion Dates of Major Remedial Activities**  
*OMC Plant 2 Site, Waukegan, Illinois*

Component	Completion Date <sup>a</sup>
Feasibility Study	December 2006
TCE DNAPL Bench-Scale Test	March 2008
Supplemental Feasibility Study	August 2008
Record of Decision (for groundwater and DNAPL)	February 2009
Final Basis of Design Report	December 2009
USEPA approval to initiate RA for DNAPL	July 19, 2011
USEPA issue Technical Directive Memorandum authorizing backfilling	September 1, 2011
ISSM Services Notice of Award	August 8, 2011
ISSM Services Notice to Proceed	August 22, 2011
Direct Push Technology Services Notice of Award	September 9, 2011
Earthwork Services Notice of Award	September 14, 2011
Earthwork Services Notice to Proceed	September 15, 2011
Direct Push Technology Services Notice to Proceed	September 21, 2011
Backfilling	September 22, 2011
Delineation of TCE DNAPL area	September 28, 2011
ISSM Mobilization	October 10, 2011 <sup>b</sup>
Start of Soil Mixing	November 5, 2011 <sup>b</sup>
Completion of Soil Mixing	December 7, 2011
ISSM Demobilization	December 13, 2011
Geotextile Cap and Granular Cover	February 1, 2012
Post-Mixing Performance Monitoring Sampling, 2-month	February 7 and 8, 2012
Final Site Survey	April 30, 2012
Post-Mixing Performance Monitoring Sampling, 6-month	June 7, 2012
Final inspection	July 26, 2012

<sup>a</sup>Date represents the date that the activity was completed unless otherwise noted.

<sup>b</sup>Date indicates the starting date for the activity.

## Construction Activities

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CH2M HILL completed the subcontracting and the construction activities as presented in Table 2-1. The major ISSM construction activities are described in the following sections. Representative photographs of the construction activities are provided in Appendix A.

### 3.1 Preliminary Soil Mixing Activities

Based on data collected during the remedial investigation activities (CH2M HILL 2006a), the TCE DNAPL area was determined to be approximately 7,200 ft<sup>2</sup>. However, because of the building structure the southwestern extent of DNAPL area could not be fully delineated. For design purposes, an estimated area of approximately 1,700 ft<sup>2</sup> was included as part of the RA. Prior to mobilization of the ISSM services subcontractor, backfilling and delineation activities were conducted as described in the following subsections.

#### 3.1.1 Backfilling

The site conditions following the completion of the building slab and soil RA required that additional fill be brought in to raise the ground surface of the ISSM treatment area to a safe and effective working elevation prior to the commencement of delineation and ISSM activities. The size of the working platform, including the space needed for equipment access and spoils management, and estimated mix area were delineated and scope of work prepared to procure an earthwork services subcontractor. The earthwork services subcontract was awarded to DeNovo Constructors, LLC, on September 14, 2011. Between September 19 and 22, 2011, approximately 9,750 tons of crushed stone aggregate (CA-6) was imported from Franklin Aggregates, a clean offsite virgin quarry fill source. The material was brought to the site in loads of approximately 24 to 26 tons per truck, placed and spread in 1-foot horizontal lifts using a dozer and compacted with onsite heavy equipment prior to placement of the next lift. The process was continued until the entire constructed working platform was at least 2 feet above the water table (approximate surface elevation of 584 feet).

#### 3.1.2 TCE DNAPL Delineation

The DNAPL delineation activities were conducted by Environmental Field Services, Inc. (EFS) of Westfield, Indiana, between September 26 and 28, 2011, to define the southwest corner of the ISSM treatment area. Direct-push technology (DPT) methods were used to install 9 borings to the base of the aquifer, approximately 30 feet below the ground surface (Figure 3-1). A groundwater grab sample was collected from the boreholes and visually inspected for sheens or other signs of product. The headspace of the water sample was screened using a photoionization detector (PID). An organic vapor measurement in excess of 3,000 parts per million (ppm) was used to signify potential DNAPL or high concentration TCE in the borehole and that an additional boring was needed to define the extent. Borings were stepped out at approximately 20-foot increments until PID screening levels were below 3,000 ppm, and the area for treatment had been delineated (Figure 3-1). Three of the boring locations originally proposed in the quality assurance project plan were not completed because the borings conducted to the west exceeded the screening criteria (CH2M HILL 2011).

The DPT delineation consisted of the following activities:

- Mobilization of DPT equipment, personnel, and materials.
- Coordination with utilities, including public and private utility locate services, to clear the investigation area.
- Advancement of boreholes to delineate the TCE DNAPL treatment area, including collection of groundwater grab samples using a screen-point sampler at each location. Soil cuttings from the borings were contained within the proposed mix area for later treatment.

- Abandonment of boreholes using hydrated bentonite clay chips to ground surface in accordance with applicable regulations.
- Demobilization of drilling equipment, personnel, and materials.

Based on the delineation results, the DNAPL treatment area was found to be larger than the 9,900 ft<sup>2</sup> estimated in the design. The new ISSM treatment area was expanded to encompass about 11,020 ft<sup>2</sup>, resulting in an estimated treatment volume of 11,425 cubic yards.

## 3.2 In Situ Soil Mixing Activities

Field activities for in situ soil mixing were conducted between October 10, 2011, and December 13, 2011, by Geo-Solutions, Inc. (GSI) of North Kensington, Pennsylvania.

The ISSM of the TCE DNAPL consisted of the following components:

- Mobilization
- Performance of soil mixing
- Performance of quality assurance/quality control sampling, including baseline sampling
- Demobilization

### 3.2.1 Mobilization

GSI mobilized to the site on October 10, 2011, and prepared the site for the mixing. The activities included utility locating, building the containment berm, installing silt fencing, staking the treatment area, installing the snow fence to designate the exclusion zone and laydown area for materials, setting up office trailers, hooking up to electric and water utilities, and setting up the soil mixing equipment.

#### 3.2.1.1 Geophysical Survey

A geophysical survey of the treatment area was conducted on October 10, 2011, by a private utility locator subcontracted by GSI to identify potential underground utilities or obstructions prior to initiation of intrusive activities. The geophysical survey indicated that the treatment area did not contain buried conduits, utility lines, or significant buried objects.

#### 3.2.1.2 Survey

Prior to soil mixing activities, the soil mix boundary was staked by CH2M HILL. Based on the boundary data, GSI developed a plan for the number of columns and surveyed the column points and elevations. The survey was completed by a licensed surveyor on November 1, 2011. Surface elevation was determined to be approximately 584 feet.

At the request of CH2M HILL, GSI established three new control points in locations that will remain during the remaining construction anticipated at the site. The control points can be used to locate the extent of the soil mixing zone for the purposes of deed restrictions and future site uses. Physical locations and northings, eastings, and elevations of the soil mixing area and established control points are presented in GSI's *Close-Out Report/Soil Mixing Job Summary* (closeout report; GSI 2012) provided in Appendix B.

#### 3.2.1.3 Berm and Erosion and Sediment Control Construction

Erosion and sediment controls were implemented in accordance with the approved plans. An approximately 1- to 2-foot-high berm consisting of granular fill was constructed to contain soil volume expansion and prevent uncontrolled discharge of treated material from the treatment area.

Silt fencing was installed around the perimeter of the designated working area. Additionally, high-visibility fencing and warning signs were installed around the treatment area to identify and control access into the exclusion zone.

## 3.2.2 Soil Mixing

Soil mixing was initiated by GSI on November 5, 2011, with a second shift (24-hour production) beginning on November 16, 2011. Soil mixing and demobilization was completed on December 7, 2011, and December 13, 2011, respectively.

### 3.2.2.1 Mixing Equipment and Implementation

ISSM activities were conducted by GSI from November 5 to December 7, 2011. The treatment area layout was designed by GSI and consisted of 224 9-foot-diameter overlapping columns over approximately 11,000 ft<sup>2</sup> as shown in Figure 3-2. The mixing depth, based on the preliminary soil RA surface and the depth to the clay till confining layer, was estimated to be approximately 28 feet below ground surface (bgs) or a calculated treatment volume of 9,230 yd<sup>3</sup>. The average mixing depth during construction activities was about 22 feet below the preliminary mixing surface of approximately 582 feet. The preliminary mix surface elevation reflects the removal of 2 to 3 feet of overburden material from the treatment area to allow the auger rig to work from the highest elevation possible to improve stability prior to mixing, and represents the “zero” elevation. Therefore, an average depth of mixing of 24 to 25 feet bgs was completed during construction.

The mixing was conducted with a Delmag RH-18 excavator mounted rotary drilling rig modified to accept large-diameter mixing tools with the capability to pump fluid through the hollow-stemmed mixing shaft (generally known as a Kelly Bar) and mixing tools. The rig was equipped with a mast inclination measuring system with an automatic mast adjustment to assure that the soil-mixed columns were installed within the vertical tolerance of  $\pm 1$  percent. The rig’s electronic monitoring and control system monitored verticality, penetration depth, penetration rate, number of strokes, total time, grout flow and pressure, and rotary head pressure. Reports generated by the monitoring system are provided as part of GSI’s daily quality control reports provided in Appendix C. Mixing began in the southwestern portion of the treatment zone and worked primarily west to east along the column alignment.

Once the auger was lined up with the appropriate column center point, the mixing process began by initiating rotation of the auger and pumping bentonite slurry without ZVI. The slurry was used as a lubricant in the initial down stroke. The auger was lowered at a consistent rate, maintaining auger rotation speed and slurry flow until it reached the top of the till layer. The injection mix was switched to slurry with ZVI, and the auger was withdrawn, turning the auger on the upstroke to the surface. Additional full strokes were completed when necessary to deliver the required amount of ZVI for each column and to achieve homogenization of the mixed column to the design specification (<25 percent variation between depths within a column). Most columns mixed received one to two full (down and up) strokes to achieve the target ZVI percentage.

An assist excavator was used to manage the excess spoils generated during the mix process, which consisted of moving the spoils away from the immediate mixing area, constructing intermediate temporary soil berms within the mixing area to contain the spoils, and re-grading the work area when necessary. The spoils were contained within the footprint of the soil mix area and work pad.

The average and maximum number of cubic yards mixed per day during single, 12-hour shifts were 175 and 229 yd<sup>3</sup>, respectively. The average and maximum number of cubic yards mixed per day during double shifts (24-hour operation) were 506 and 825 yd<sup>3</sup>, respectively. Averages exclude Sundays, holidays, and other designated “non-mixing” days. Soil-mixing production was conducted over a total of 22 days, and 60 percent of the total cubic yardage mixed was completed in the last 9 days. Soil mixing production for the duration of the mixing activities is shown in Figure 3-3.

### 3.2.2.2 Materials

Peerless Cast Iron Aggregate Size 50D ZVI was mixed to a target concentration of 2 percent by weight in a bentonite slurry with a WYO-BEN, Inc., hydrogel bentonite meeting American Petroleum Institute Standard 13A, Section 9. The bentonite slurry was mixed to a target concentration of 1 percent by weight. ZVI and bentonite were delivered to the site in super sacks weighing approximately 3,000 pounds and 2,750 pounds, respectively, with the exception of one load of bentonite supplied by a local driller in 50-pound bags. Certification was provided at time of delivery, and tickets are provided in GSI’s closeout report (Appendix B). A total of 609,000 pounds of ZVI and 332,750 pounds of bentonite were mixed with approximately 8,981 yd<sup>3</sup> of soil in the treatment area.

Potable water for the mixing process was piped from the water supply for the Triax Building.

### 3.2.2.3 Batch Plant Equipment

The batch plant produced a bentonite slurry by mixing bentonite with water in a high-volume, high-shear “flash mixer” that also functioned as a bentonite slurry storage frac tank. In addition to the slurry mixer, a stainless-steel hopper was installed at the fluid (slurry) intake stream immediately prior to the progressive cavity pump to allow for ZVI injection. The ZVI was stored in a supersack silo equipped with load cells allowing for precise metering of the ZVI material into the stainless-steel hopper and through to the pump to be delivered to the ISSM column.

The original batch plant was replaced on November 19, 2011. The configuration was altered because of plugging caused by the addition of dry ZVI at the fluid intake stream immediately prior to the progressive cavity pump, reducing the suction capabilities of the pump until it was no longer functional. The new batch plant configuration used the same flash mixer to produce bentonite slurry but included a second mixer. Bentonite slurry was pumped into the second “lightning mixer” where ZVI was added through the supersack silo with load cells. High-speed mixing paddles kept the ZVI in suspension until the bentonite/ZVI slurry was pumped through the progressive cavity pump to be delivered to the ISSM column. A separate connection and valves were added prior to the pump to accommodate pumping a bentonite-only slurry through to the column when necessary.

### 3.2.2.4 Engineering Controls

Based on the design, emissions generated during soil mixing were to be managed using a metal shroud, or similar, to tightly seal the surface cross section of the actively treated soil mass that had been disturbed due to the mixing. Organic vapors generated during mixing would be captured inside the shroud and drawn by vacuum to the treatment system through hoses connected to the shroud. Vapors would be contained and treated using necessary filters and an appropriately sized activated carbon unit before discharge to the atmosphere.

During the preliminary construction meeting, GSI indicated that the use of the bentonite slurry would greatly reduce fugitive emissions during the mixing, and the shroud would not be needed. Rather than the shroud, GSI proposed having foam onsite for use, if organic vapor emissions needed to be addressed during the mixing. Air monitoring conducted during mixing activities confirmed engineering controls for organic vapors were not required.

## 3.2.3 Soil Sampling

During mixing, samples were collected for iron content analysis for quality assurance/quality control purposes. Additionally, soil samples were collected from middle and bottom depths at select locations to establish baseline or time-zero VOC concentrations for soil in the treatment area.

### 3.2.3.1 Quality Assurance/Quality Control Sampling

CH2M HILL performed testing on the soil samples to verify percent by weight of ZVI delivered and homogenization of the applied material with native soil. Samples were collected each day by inserting a mechanical sampling tool onto the mixing auger of the rig and pushing the tool to the desired sampling depths. During the first week of mixing, two columns per day were sampled. Samples from the first column of the day were collected from the bottom, middle, and top. Samples from the second column of the day were collected from the bottom and middle. After the first week, the sampling was reduced and samples were collected from the bottom and middle depths in one column per day. Collected samples were provided to CH2M HILL for magnetic separation field testing to determine the approximate iron content. The results of the magnetic separation testing were used to determine if (1) the target quantity of ZVI had been mixed into each column and (2) the ZVI was homogenized throughout the column. A subset of the samples was also sent to a laboratory in USEPA’s Contract Laboratory Program (CLP) to be analyzed for VOCs by USEPA Method 8260B. The analytical data were to establish baseline conditions as described in subsequent sections. Sample locations are shown in Figure 3-2.

A summary of the quality assurance/quality control soil sampling results is provided in Table 3-1. The results from the magnetic separation tests indicated that target iron percentage ( $2 \pm 0.5$  percent) as well as adequate homogenization column (<25 percent variation between depths in a column) were achieved for each column except at one location. At column H35 the method used to mix in the ZVI was temporarily altered due to issues with pumping through the batch plant. While the batch plant was down, the ZVI was manually mixed into the column, and the subsequent iron

content analysis failed. Once the batch plant was back online, the location was remixed using the standard augering method, was re-tested, and the iron content reached the target criteria.

Quality control reports were completed daily by GSI for each shift for the duration of the project. The reports documented, at a minimum, completed columns, a summary of daily activities, conversations, safety, delays, and personnel onsite, actual top and bottom elevations for each column, target and actual slurry (in gallons), target and actual ZVI used in each column, the number of mixing strokes in each column, whether or not a sample was collected in each column, density and viscosity of the slurry, total pounds of bentonite and ZVI delivered to the site, total pounds of bentonite and ZVI used per day, and total gallons of water used per day. GSI's daily quality control reports are provided in Appendix C. During the course of the soil mixing, GSI installed 224 9-foot-diameter columns. A total of 609,000 pounds of ZVI was mixed with approximately 8,981 yd<sup>3</sup> of soil for an estimated 67.8 pounds/yd<sup>3</sup> or an addition rate of 2.4 percent (assuming an *in situ* soil density of 103.7 pounds per cubic foot [lbs/ft<sup>3</sup>]). A total of 332,750 pounds of bentonite was mixed with about 8,981 yd<sup>3</sup> of soil for a total of 37.1 lbs/yd<sup>3</sup> or an addition rate of 1.3 percent (assuming an *in situ* soil density of 103.7 lbs/ft<sup>3</sup>). Delivery tickets are included as an appendix to GSI's closeout report (Appendix B). The quantities of ZVI and bentonite delivered into each column are presented in GSI's daily quality control reports (Appendix C). The northing and easting coordinates for each of the column center points are provided in the survey spreadsheet in GSI's closeout report in Appendix B.

### 3.2.3.2 Baseline Soil Sampling

Baseline or time-zero soil samples were collected at a subset of the columns tested for quality verification. The selected columns were sampled immediately following mixing, and samples were submitted to a CLP laboratory to be analyzed for VOCs on a rush turnaround time (72 hours). Two samples were collected from one column per approximately every 1,000-yd<sup>3</sup> of mixed soils. The first sample was collected within 1 foot of the bottom, and the second at about mid-depth of the column. A total of 20 samples were collected from 10 different columns dispersed throughout the mixing area (Figure 3-2). The average TCE concentration in the 2 samples collected from each of the 10 columns are presented in Table 3-2. The results for the baseline soil samples are presented in the cleanup status report provided in Appendix D.

### 3.2.4 Demobilization

Demobilization included decontamination and breakdown of batch plant and soil mixing equipment. The equipment was loaded onto trailers for transportation offsite, and the rental equipment was mobilized offsite to the appropriate rental company or temporarily staged for pickup. Silt and snow fences remained in place. Temporary facilities such as work trailers and utilities were disconnected and demobilized. All personnel demobilized from the site on December 13, 2011. General long-term maintenance of the area will be the responsibility of USEPA until transfer of the property to the City of Waukegan or another party.

## 3.3 Post-soil Mixing Activities

### 3.3.1 Grading and Backfilling

Grading, geotextile placement, and backfilling activities were conducted by GSI from January 23, 2012, to February 1, 2012. Upon completion of the soil mixing activities, the treatment area was graded by pulling in existing spoils to minimize the overall area footprint and to minimize sloping to the extent possible. The entire treatment area was covered with a woven geotextile fabric for stability, safety, and access to the area. The geotextile data sheet is provided in Appendix E. The liner panels were overlapped and sewn in the field to cover the entire treatment area of about 2,500 square yards. The panels were secured at the edges of the treatment area with stake pins. Approximately 1 foot of granular backfill (approximately 743 yd<sup>3</sup> or about 1,200 tons assuming a density of 1.6 tons/yd<sup>3</sup>) was placed in lifts and compacted over the geotextile and graded to promote drainage away from the treatment area.

Final topsoil, seeding, and fence installation was determined unnecessary due to current conditions of the site and the additional construction activities that will be occurring as part of the Waukegan Harbor RA. A final site survey of the graded and backfilled soil mixing area, with geotextile fabric, was conducted on April 30, 2012, by Howard

Surveying Company, Inc. (a subcontractor to GSI), a professionally licensed land surveyor from Beach Park, Illinois. The final site survey is included as part of the GSI closeout report in Appendix B (GSI 2012).

### 3.3.2 Performance Monitoring Sampling

Performance (post-mix) monitoring consisting of soil sampling and installation and water sampling of two temporary piezometers located within the soil mixing area.

The performance of the ISSM was evaluated through monitoring of soil and groundwater samples from the locations shown in Figure 3-2. Post-treatment soil data collected in February 2012, 2 months following completion of the ISSM activities were compared to baseline data to evaluate the overall effectiveness of the RA. Because the monitoring wells in and around the mix area were abandoned as part of the soil cleanup, groundwater samples were not collected prior to mixing. A second round of water samples were collected in June 2012, 4 months after the installation of the temporary wells to monitor changes in the TCE concentrations within the mixed area over time. Samples were collected in June 2012 to examine changes in water concentrations within the treated soil. The soil and water samples were submitted to CLP laboratories to be analyzed for VOCs. The sampling, analytical results, and discussion of data quality are summarized in the cleanup status report (Appendix D). A summary of performance data for the soil and groundwater is presented in Tables 3-2 and 3-3, respectively.

TABLE 3-2  
Soil TCE Concentrations and Percent Reduction  
OMC Plant 2 Site, Waukegan, Illinois

Column ID	TCE Concentration (micrograms per kilogram)		Percent Reduction
	Baseline	2-month	
B47	8,200	6	99.93
G42	24,500	47	99.81
C38	14,000	3	99.98
J31	40,500	27	99.93
N27	16,500	172	98.96
D29	73,500	145	99.80
I20	110,000	236	99.79
G14	195,000	665	99.66
K8	720,000	870	99.88
F5	93,000	640	99.31

**Note:** Concentrations shown are average of bottom sample and middle sample results.

TABLE 3-3  
Groundwater TCE Concentrations and Percent Reduction  
OMC Plant 2 Site, Waukegan, Illinois

Sample/Column ID	TCE Concentration (micrograms per kilogram)		Percent Reduction
	2-month	6-month	
TW-001 (K8)	730,000J	540,000	26
TW-002 (D29)	23,000	1.8J	99.99

J – Estimated Result

### 3.3.2.1 Post-Mixing Soil Sampling

Soil samples were collected approximately 2 months after mixing activities and analyzed by a CLP laboratory for VOCs. Locations, depths, and sampling frequency were identical to the baseline or time-zero soil samples. Two samples were collected from one column per approximately every 1,000 yd<sup>3</sup> of mixed soils. The first sample was collected within 1 foot of the bottom and the second at mid-depth. The 20 soil samples were collected using DPT methods by EFS to obtain samples from the proper depth. Borings were advanced in the same columns as during baseline soil sampling and were located using the GPS coordinates provided by GSI in their closeout report (GSI 2012). Results for the post-mixing samples are presented in Figure 3-2, and the average TCE concentration in each of the 10 columns are summarized in Table 3-2.

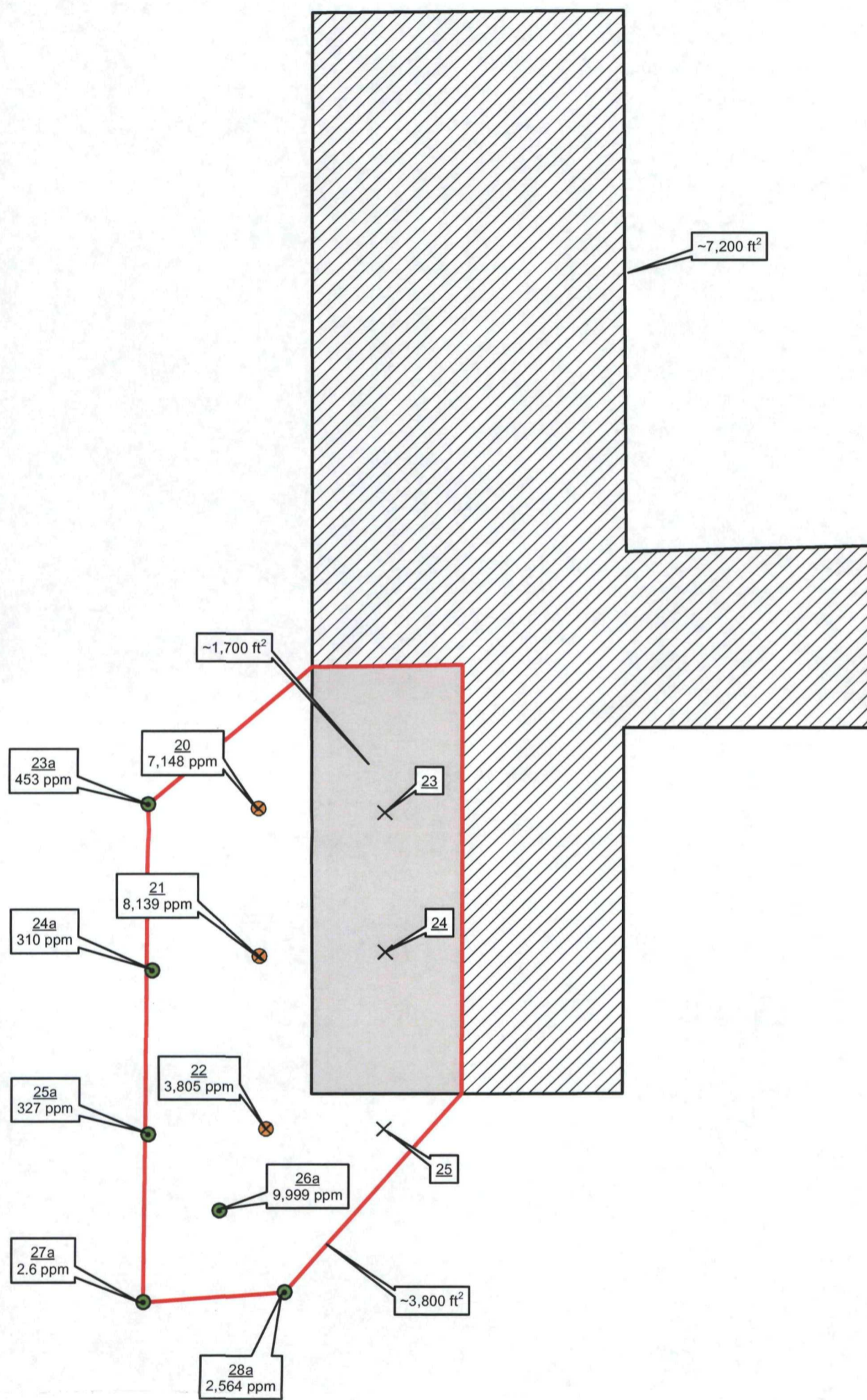
### 3.3.2.2 Post-Mixing Groundwater Monitoring

Temporary wells were installed to characterize the water in the treatment area and were co-located to columns from which soil samples were collected. The wells were installed to the till layer by direct push of 2-inch tooling and insertion of 1-inch pre-packed screen and casing. Wells were sealed using bentonite chips and capped with j-plugs. Wells were surged and purged for development until over 10 well volumes were removed. Purge water was containerized in a 55-gallon U.S. Department of Transportation drum and characterized by the drilling subcontractor for offsite disposal.

Low-flow sampling was completed as described in Field Operating Procedure No. 1—*Low Flow Groundwater Sampling Procedures* (CH2M HILL 2011). Field parameters, including depth to water, pH, specific conductance, conductivity, temperature, dissolved oxygen, and turbidity, were measured at 5-minute intervals using a YSI 650MDS multiprobe meter and sonde mounted in a sealed flow-through cell. Groundwater samples were collected directly from the disposable tubing into pre-preserved laboratory prepared sample bottles. The samples were analyzed for VOCs by CLP laboratory and submitted to CT Laboratories of Baraboo, Wisconsin, for analysis of dissolved gases and chloride. The TCE concentrations in the groundwater samples are presented in Figure 3-2 and in Table 3-3.

TABLE 3-1  
QA/QC Soil Sampling Log  
OMC Plant 2 - TCE DNAPL In Situ Soil Mixing  
Waukegan, Illinois

VOC Soil Sampling						Dry Weight Analysis						Iron Analysis					
Date	Column ID	Depth (ft bgs)	Sample	Sample ID	Depth (ft bgs)	Cup Weight (grams)	Cup + Wet Sample Weight (grams)	Wet Sample Weight (grams)	Cup + Dry Sample Weight (grams)	Dry Sample Weight (grams)	Water Fraction	Wet Sample Weight (grams)	Dry Sample Weight (grams)	Iron		Notes	
			Collected? (Y/N - Time)											Recovered (grams)	Percent Iron (%)		
11/7/2011	F47	18-19	N	NA	NA	23.33	49.87	26.54	42.7	19.37	0.27	154.92	113.07	2.55	2.3	Use backup scale to 0.1g until new scale arrives.	
		10-11	N	NA	NA	23.12	48.89	25.77	42.93	19.81	0.23	152.05	116.88	2.57	2.2		
		2-3	N	NA	NA	23.89	51.75	27.86	44.61	20.72	0.26	154.31	114.76	2.54	2.2		
11/8/2011	J43	18-19	N	NA	NA	23.72	55.19	31.47	45.8	22.08	0.30	154.08	108.11	2.23	2.1		
		10-11	N	NA	NA	23.14	60.68	37.54	50.02	26.88	0.28	158.56	113.53	2.33	2.1		
		2-3	N	NA	NA	23.23	49.27	26.04	41.17	17.94	0.31	154.96	106.76	2.31	2.2		
11/8/2011	C48	17-18	N	NA	NA	23.3	48.8	25.5	42.1	18.8	0.3	152.0	112.1	2.7	2.4		
		9-10	N	NA	NA	23.1	51.3	28.2	43.9	20.8	0.3	147.8	109.0	2.6	2.4		
		12-13	N	NA	NA	17.5	43.5	26.0	36.6	19.1	0.3	148.1	108.8	2.8	2.6		
11/9/2011	E46	7-8	N	NA	NA	20.8	48.3	27.5	40.8	20.0	0.3	149.0	108.4	2.7	2.5		
		2-3	N	NA	NA	23.2	43.1	19.9	37.6	14.4	0.3	141.3	102.2	2.8	2.7		
		17-18	N	NA	NA	23.4	47.0	23.6	40.8	17.4	0.3	150.2	110.7	3.0	2.7		
11/9/2011	G44	9-10	N	NA	NA	22.3	46.7	24.4	40.2	17.9	0.3	140.5	103.1	2.8	2.7		
		18-19	N	NA	NA	21.5	45.2	23.7	39.5	18.0	0.2	142.6	108.3	2.9	2.7		
		10-11	N	NA	NA	22.5	55.0	32.5	46.6	24.1	0.3	141.5	104.9	2.8	2.7		
11/10/2011	I42	2-3	N	NA	NA	21.5	52.2	30.7	44.1	22.6	0.3	145.6	107.2	2.9	2.7		
		18-19	Y (16:00)	OMC-SO-001-B	18-19	22.6	47.4	24.8	41.4	18.8	0.2	148.4	112.5	3.0	2.7		
		10-11	Y (16:38)	OMC-SO-001-M	10-11	21.4	45.6	24.2	40.0	18.6	0.2	146.0	112.2	2.9	2.6		
11/11/2011	D45	18-19	N	NA	NA	21.51	48.93	27.42	41.96	20.45	0.25	146.73	109.43	2.73	2.5		
		10-11	N	NA	NA	21.38	52.41	31.03	43.86	22.48	0.28	152.22	110.28	2.74	2.5		
		2-3	N	NA	NA	22.63	43.84	21.21	37.83	15.2	0.28	143.47	102.82	2.54	2.5		
11/11/2011	G42	18-19	Y (16:30)	OMC-SO-002-B	18-19	22.48	50.59	28.11	43.86	21.38	0.24	145.09	110.35	3.09	2.8		
		10-11	Y (16:45)	OMC-SO-002-M	10-11	23.12	56.79	33.67	48.33	25.21	0.25	143.38	107.35	3.11	2.9		
11/14/2011	K38	18-19	N	NA	NA	23.33	54.61	31.28	45.92	22.59	0.28	158.47	114.44	3.26	2.8		
		10-11	N	NA	NA	21.36	47.53	26.17	40.8	19.44	0.26	146.4	108.75	3.03	2.8		
		18-19	N	NA	NA	22.25	48.44	26.19	42.32	20.07	0.23	144.31	110.59	2.93	2.6		
11/15/2011	F41	10-11	N	NA	NA	21.5	62.22	40.72	52.72	31.22	0.23	142.15	108.99	2.84	2.6		
		18-19	N	NA	NA	17.43	48.28	30.85	41.25	23.82	0.23	140.48	108.47	2.61	2.4		
		10-11	N	NA	NA	20.9	49.17	28.27	42.28	21.38	0.24	138.54	104.77	2.56	2.4		
11/16/2011 Day	F39	18-19	N	NA	NA	21.72	51.78	30.06	44.51	22.79	0.24	137.67	104.37	2.31	2.2		
10-11		N	NA	NA	20.99	49.27	28.28	42.49	21.5	0.24	155.71	118.38	2.67	2.3			
11/16/2011 Night	B43	18-19	N	NA	NA	21.58	49.66	28.08	43.2	21.62	0.23	146.11	112.50	2.35	2.1		
10-11		N	NA	NA	23.19	46.92	23.73	41.21	18.02	0.24	142.86	108.48	2.19	2.0			
11/17/2011 Day	K34	18-19	N	NA	NA												
11/17/2011 Night	No sample for this shift due to operational issues with ZVI pumping																
11/18/2011 Day	H35	18-19	N	NA	NA	17.43	47.26	29.83	40.19	22.76	0.24	154.02	117.52	1.53	1.3		Tried manually mixing due to pumping issues. Fail and will re-mix.
10-11		N	NA	NA	20.89	52.78	31.89	45.28	24.39	0.24	154.8	118.39	1.48	1.3			
2-3		N	NA	NA	21.4	65.51	44.11	55.44	34.04	0.23	147.79	114.05	1.5	1.3			
11/18/2011 Night	No night shift due to batch plant down.																
11/19/2011 Day	No sample due to new batch plant and pump being installed and configured																
11/19/2011 Night	I34	19-20	N		NA	23.35	50.08	26.73	45.37	22.02	0.18	157.37	129.64	2.57	2.0	Re-sample and analysis after mixing in additional iron w/auger.	
11-12		N		NA	22.47	48.2	25.73	43.42	20.95	0.19	145.42	118.40	2.38	2.0			
2-3		N		NA	21.38	50.51	29.13	44.42	23.04	0.21	148.77	117.67	2.11	1.8			
H35	18-19	N		NA	22.41	51.37	28.96	45.59	23.18	0.20	146.49	117.25	3.5	3.0			
	10-11	N		NA	21.05	44.8	23.75	38.85	17.8	0.25	150.32	112.66	3.1	2.8			
	2-3	N		NA	23.2	44.54	21.34	39.27	16.07	0.25	150.39	113.25	2.9	2.6			



#### Legend

- Stepout Delineation Boring
- ⊗ Planned Delineation Boring(Completed)
- ✕ Planned Delineation Boring(Not Completed)
- ▨ Delineated TCE DNAPL
- Estimated Southwest Extent of TCE DNAPL
- September 2011 Delineated Southwest Extent of TCE DNAPL

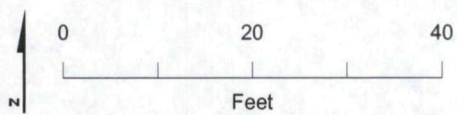


Figure 3-1  
TCE DNAPL Delineation  
OMC Plan 2 ISSM  
Waukegan, IL

F5	SO-010-B		SO-010-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	520 U	5.4 U	530 U	5.5 U
CIS-1,2-DICHLOROETHYLENE	15,000	3.5 J	13000	5 J
TRICHLOROETHYLENE	96000	780	90000	500

G14	SO-008-B		SO-008-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	1700 U	5.3 U	1600 U	5.2 U
CIS-1,2-DICHLOROETHYLENE	2400	8.3	3000	2.7 J
TRICHLOROETHYLENE	180000	820	210000	510

D29	SO-006-B		SO-006-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	680 U	5.5 U	730 U	6.1 U
CIS-1,2-DICHLOROETHYLENE	3100	19	2900	26
TRICHLOROETHYLENE	81000 J	89	66000	200

D29	TW-002		
	Baseline	Two-Month	Six-Month
VINYL CHLORIDE, µg/L	NA	250 U	0.87 J
CIS-1,2-DICHLOROETHYLENE, µg/L	NA	48000	58
TRICHLOROETHYLENE, µg/L	NA	23000	1.8 J
CHLORIDE (AS CL), mg/L	NA	470	NA
ETHANE, µg/L	NA	3000 J	NA
ETHYLENE, µg/L	NA	5900 J	NA
METHANE, µg/L	NA	110 J	NA

C38	SO-003-B		SO-003-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	63 U	5.2 U	63 U	5.2 U
CIS-1,2-DICHLOROETHYLENE	940	7.3	850	6.7
TRICHLOROETHYLENE	16000	2.8 J	12000 J	4 J

B47	SO-001-B		SO-001-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	62 U	5.2 U	64 U	6.1 U
CIS-1,2-DICHLOROETHYLENE	2000	8.2	3300	2.4 J
TRICHLOROETHYLENE	5400	5.2 U	11000	6.1 U

K8	TW-001		
	Baseline	Two-Month	Six-Month
VINYL CHLORIDE, µg/L	NA	2500 U	20000 UJ
CIS-1,2-DICHLOROETHYLENE, µg/L	NA	28000	20000 U
TRICHLOROETHYLENE, µg/L	NA	730000 J	540000
CHLORIDE (AS CL), mg/L	NA	1700 J	NA
ETHANE, µg/L	NA	3800	NA
ETHYLENE, µg/L	NA	7700	NA
METHANE, µg/L	NA	110	NA

K8	SO-009-B		SO-009-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	8400 U	5.2 U	7400 U	6.3 U
CIS-1,2-DICHLOROETHYLENE	8400 U	15	7400 U	6.3 U
TRICHLOROETHYLENE	690000	930	750000	810

I20	SO-007-B		SO-007-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	680 U	5.5 U	600 U	5 U
CIS-1,2-DICHLOROETHYLENE	2400	6	1900	16
TRICHLOROETHYLENE	120000 J	380	100000	91

N27	SO-005-B		SO-005-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	300 U	6.1 U	320 U	6.6 U
CIS-1,2-DICHLOROETHYLENE	2400	110	2700	19
TRICHLOROETHYLENE	17000	340	16000	3.2 J

J31	SO-004-B		SO-004-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	60 U	5.6 U	57 U	5.5 U
CIS-1,2-DICHLOROETHYLENE	920 J	5.6 U	610 J	4.1 J
TRICHLOROETHYLENE	53000	42	28000	11

G42	SO-002-B		SO-002-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	63 U	5.2 U	63 U	5.7 U
CIS-1,2-DICHLOROETHYLENE	1400	150	3400	20
TRICHLOROETHYLENE	15000	89	34000	5.7 U

#### Legend

- Sample Collected For Iron Content Analysis
- Sample Collected For Iron Content and VOC Analysis
- ⊗ Sample Collected for VOC Analysis Only

Notes:  
All samples analyzed for iron content met or exceeded the target percentage of 2% +/- 0.5%.  
All results in micrograms per kilogram, unless otherwise noted.  
Temporary monitoring wells installed at locations K08 and D29.

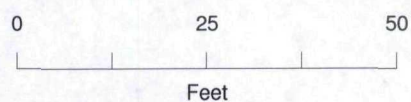
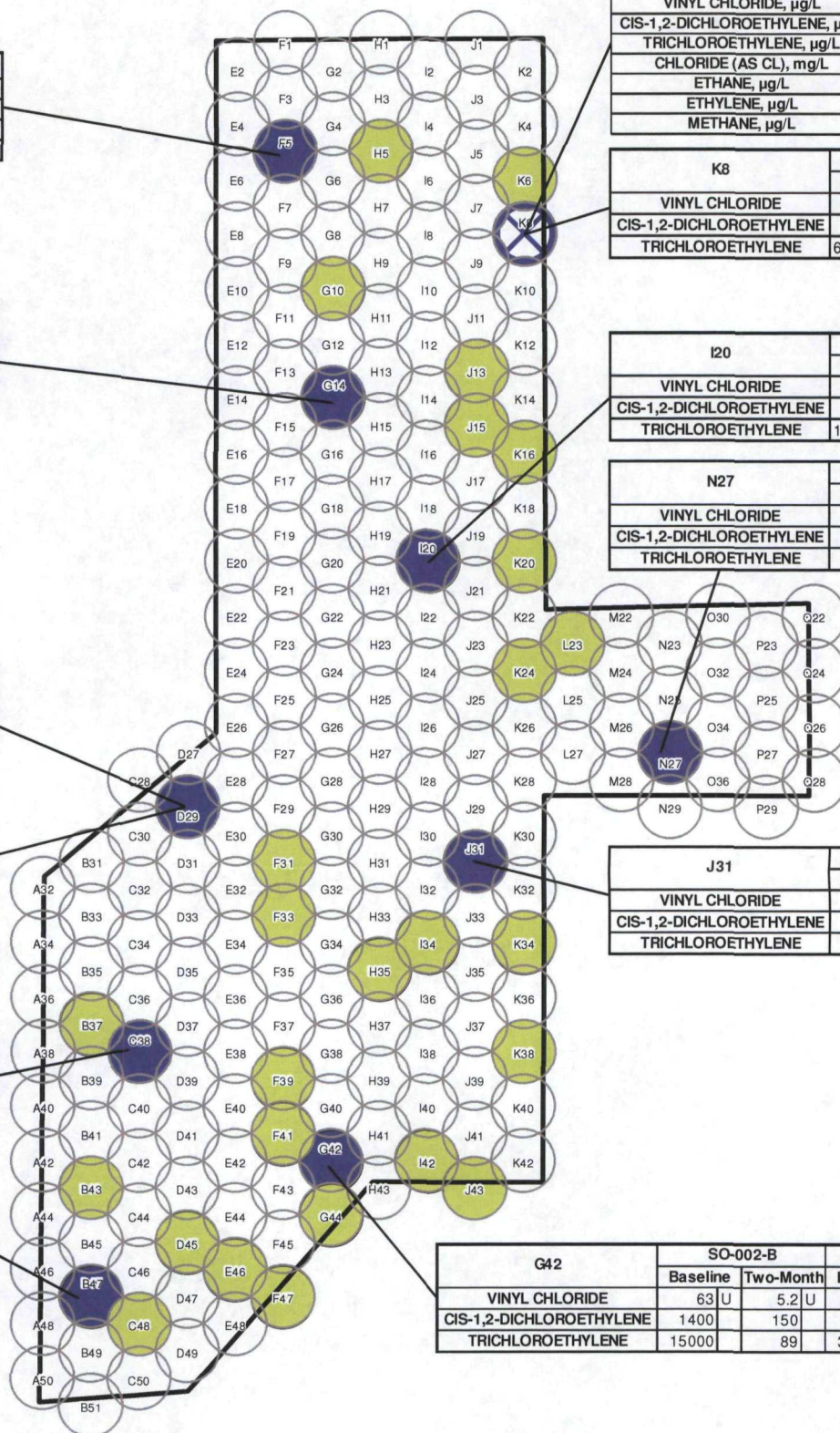
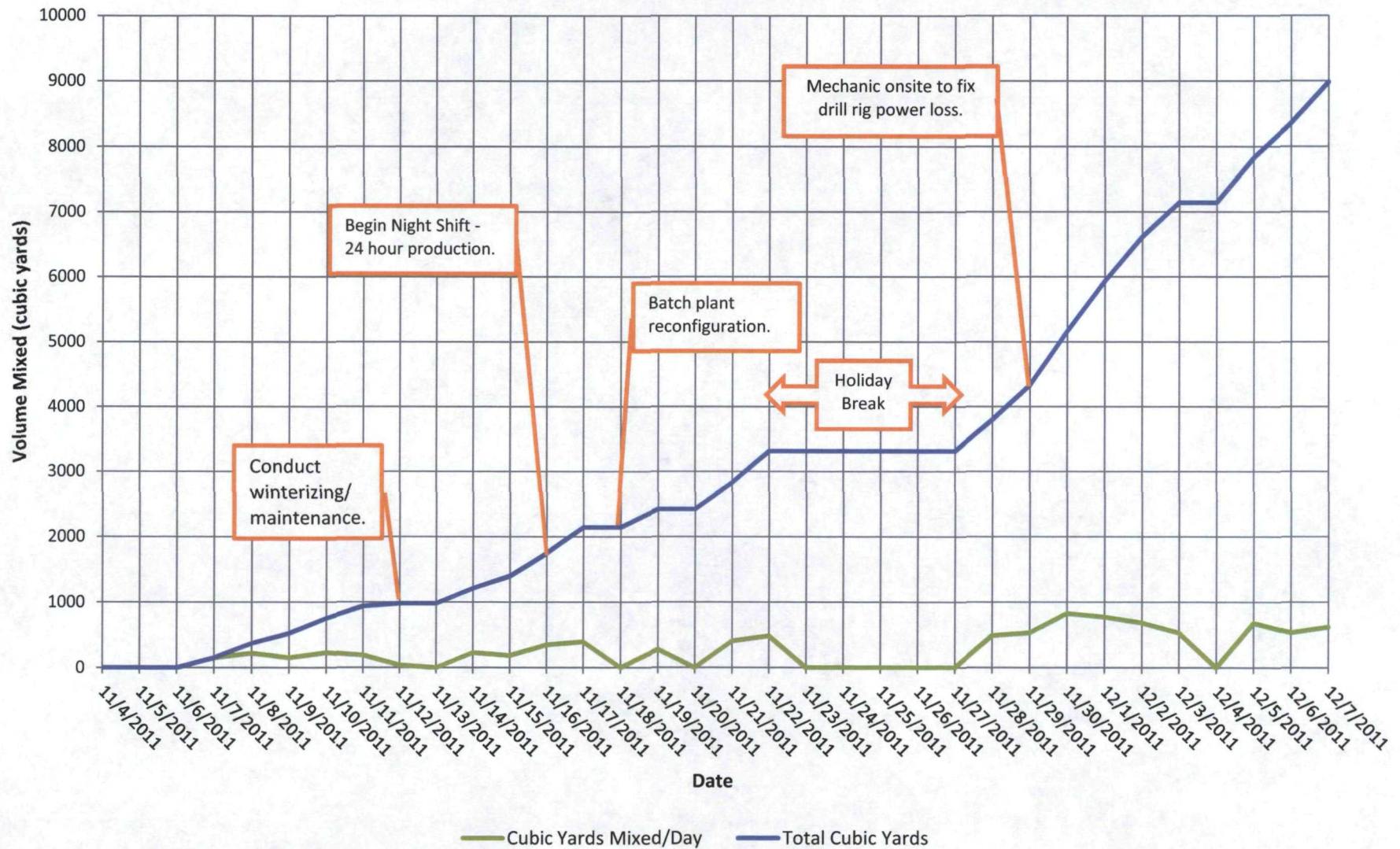


Figure 3-2  
Iron Content and VOC Sampling Results  
OMC Plant 2 ISSM  
Waukegan, IL

**Figure 3-3**  
**Soil Mixing Production**  
 OMC Plant 2 - TCE DNAPL In Situ Soil Mixing  
 Waukegan, Illinois



## SECTION 4

# Inspections

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The construction activities for the ISSM component of the groundwater remedy were completed on March 22, 2012. Based on discussions with USEPA on the construction activities for the Waukegan Harbor consolidation facility, placing the final soil layer, seeding, and fencing will not be needed for completion of the project. A final inspection that included a site visit to inspect the cap and cover was completed with USEPA on July 26, 2012. No punch list deficiencies or outstanding items were identified during the inspection that needs to be addressed. The USEPA determined that the site area was in good condition and that the requirements of the work plan had been met.

## SECTION 5

# Certification that Remedy is Operational and Functional

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CH2M HILL and USEPA completed the RA in accordance with the design requirements, including the following:

- The TCE DNAPL treatment area was successfully mixed between October 10 and December 13, 2011.
- A total of 609,000 pounds of ZVI and 332,750 pounds of bentonite were mixed into a total of approximately 8,981 cubic yards of soil within the TCE DNAPL source zone area.
- The quality control samples tested for iron content indicated mixing achieved both adequate homogenization and target iron percentage specified in the design.
- Sample results for post-mixing soil samples collected at 2 months following the end of soil mixing activities indicate an average of 99.7 percent reduction in TCE concentrations.
- Cleanup validation of groundwater is ongoing and will be verified with installation of downgradient monitoring wells and subsequent groundwater sampling as part of the long-term groundwater monitoring of the site.

## SECTION 6

# Summary of Construction Costs

A cost summary by remedial subcontractors is presented in Table 6-1.

TABLE 6-1

## Summary of Subcontract Costs

OMC Plant 2 Site, Waukegan, Illinois

Activity	Subcontractor	Subcontract No.	Total Cost (\$)
Earthwork Services	DeNovo Constructors, Inc.	771	165,377.09
DPT Drilling Services	Environmental Field Services, Inc.	770	31,714.00
ISSM Services	GeoSolutions, Inc.	724	1,410,934.40
Total Subcontract Cost			1,608,025.49

In addition, \$62,867 was paid to the Colorado State University Research Foundation for use of this technology.

A detailed breakdown of costs for each of the subcontractors is provided below in Tables 6-2 through 6-4.

TABLE 6-2

## Project Costs for Earthwork Services Subcontract

OMC Plant 2 Site, Waukegan, Illinois

Bid Item	Item	Quantity	Unit of Measure	Unit Price (\$)	Total (\$)
1	Backfilling at OMC	9,733.78	Tons	16.99	165,377.09
Subcontract Total					165,377.09

Note: LS = lump sum

TABLE 6-3

## Project Costs for DPT Drilling Services Subcontract

OMC Plant 2 Site, Waukegan, Illinois

Bid Item	Item	Quantity	Unit of Measure	Unit Price (\$)	Total (\$)
1	Mobilization/Demobilization for Borehole Drilling	1	LS	\$4,375.00	4,375.00
2	Investigative Borehole Drilling (Groundwater Sampling)	300	Feet	\$25.00	9,000.00
3	Investigative Borehole Drilling (Soil Sampling)	90	Feet	\$25.00	1,675.00
4	Mobilization/Demobilization for Temporary Well and Post Mixing Borehole Drilling	1	LS	\$4,375.00	4,375.00
5	Post Mixing Borehole Drilling (Soil Sampling)	300	Feet	\$21.00	6,174.00
6	Temporary Monitoring Well Installation	60	Feet	\$50.00	2,900.00
7	Wastewater Collection and Disposal – Non-hazardous	2	Drum	\$925.00	1,850.00
8	Wastewater Treatment	0	LS	\$1,000.00	—
9	Waste Handling Transportation and Disposal of Solid Waste – Non-hazardous	0	Drum	\$925.00	—
10	Level C upgrade	0	Hour	\$100.00	—
11	Level B upgrade	0	Hour	\$200.00	—

TABLE 6-3  
**Project Costs for DPT Drilling Services Subcontract**  
*OMC Plant 2 Site, Waukegan, Illinois*

Bid Item	Item	Quantity	Unit of Measure	Unit Price (\$)	Total (\$)
12	Piezometer Material	90	Feet	\$5.00	450.00
13	Drums	2	Drums	\$45.00	90.00
CO No. 1	Site Visit	1	LS	\$825.00	825.00
<b>Revised Subcontract Total</b>					<b>31,714.00</b>

LS = lump sum

TABLE 6-4  
**Project Costs for ISSM Services**  
*OMC Plant 2 Site, Waukegan, Illinois*

Bid Item	Description	Quantity	Unit of Measure	Unit Price (\$)	Total Cost (\$)
1	Payment/Performance Bonds	1	LS	\$30,000.00	\$30,000.00
2	Project Mobilization	1	LS	\$163,300.00	\$163,300.00
3	Project Demobilization	1	LS	\$87,000.00	\$87,000.00
4	High Visibility Fencing	800	feet	\$5.00	\$4,000.00
5	Erosion, Sediment, Flood Controls	1	LS	\$13,000.00	\$13,000.00
6	Borrow Material Sampling	2	EA	\$2,000.00	\$4,000.00
7	Borrow Material Procurement and Delivery–	1198.3	Ton	\$27.00	\$32,354.10
8	Borrow Material Procurement and Delivery– Backfill	0	Ton	\$16.00	\$0.00
9	Borrow Material Procurement and Delivery– Topsoil	0	Ton	\$17.00	\$0.00
10	Handling and Placement of Borrow Material	1150	yd <sup>2</sup>	\$43.00	\$49,450.00
11	Geotextile	2500	yd <sup>2</sup>	\$6.00	\$15,000.00
12	Containment Berm Construction	1	LS	\$48,000.00	\$48,000.00
13	ZVI	260	Ton	\$1,100.00	\$286,000.00
13a	ZVI (> 260 tons)	44.5	Ton	\$1,078.00	\$47,971.00
14	Bentonite	166.4	Ton	\$250.00	\$41,600.00
15	Off-gas Treatment	0	LS	\$25,000.00	\$0.00
16	ISSM	8981.1	yd <sup>3</sup>	\$63.00	\$565,809.30
17	Level B upgrade	0	Hour	—	\$0.00
18	Level C upgrade	0	Hour	—	\$0.00
19	Waste Handling, Transportation, Disposal of Aqueous Waste –Non-hazardous	0	gallon	\$0.88	\$0.00
20	Wastewater Treatment		LS	\$47,000.00	\$22,560.00
21	Chain Link Fencing	0	Feet	\$30.00	\$0.00
22	Seeding	0	Feet <sup>2</sup>	\$0.50	\$0.00
23	Surface Restoration	0	Feet <sup>2</sup>	\$1.00	\$0.00

TABLE 6-4  
**Project Costs for ISSM Services**  
*OMC Plant 2 Site, Waukegan, Illinois*

Bid Item	Description	Quantity	Unit of Measure	Unit Price (\$)	Total Cost (\$)
CO No. 1	Oversight Trailer	1	LS	\$5,024.00	\$5,024.00
CO No. 2	Foam Unit (Credit)	1	LS	(\$4,134.00)	(\$4,134.00)
<b>Revised Subcontract Total</b>					<b>\$1,410,934.40</b>

LS = Lump Sum  
 EA = Each  
 CO = change order

## SECTION 7

# References Cited

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CH2M HILL. 2006a. *Remedial Investigation Report, OMC Plant 2, Waukegan, Illinois*. April.

CH2M HILL. 2006b. *Feasibility Study Report, OMC Plant 2, Waukegan, Illinois*. December.

CH2M HILL. 2008a. *Enhanced In Situ Bioremediation Pilot Study Report, OMC Plant 2, Waukegan, Illinois*. March.

CH2M HILL. 2008b. *Supplemental Feasibility Study Report, OMC Plant 2, Waukegan, Illinois*. July.

CH2M HILL. 2009. *Basis of Design Report, Final Design for Remediation of Groundwater and TCE DNAPL, OMC Plant 2, Waukegan, Illinois*. December.

CH2M HILL. 2011. *Quality Assurance Project Plan, Remediation of Groundwater and Dense Nonaqueous Phase Liquid, OMC Plant 2, Waukegan, Illinois*. February.

Geo-Solutions, Inc. (GSI). 2012. *Close-Out Report/Soil Mixing Job Summary, OMC Plant 2 Superfund Site, TCE Impacted Zone, Waukegan, Illinois*. January 26.

Appendix A  
Photograph Log

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## Photograph Log

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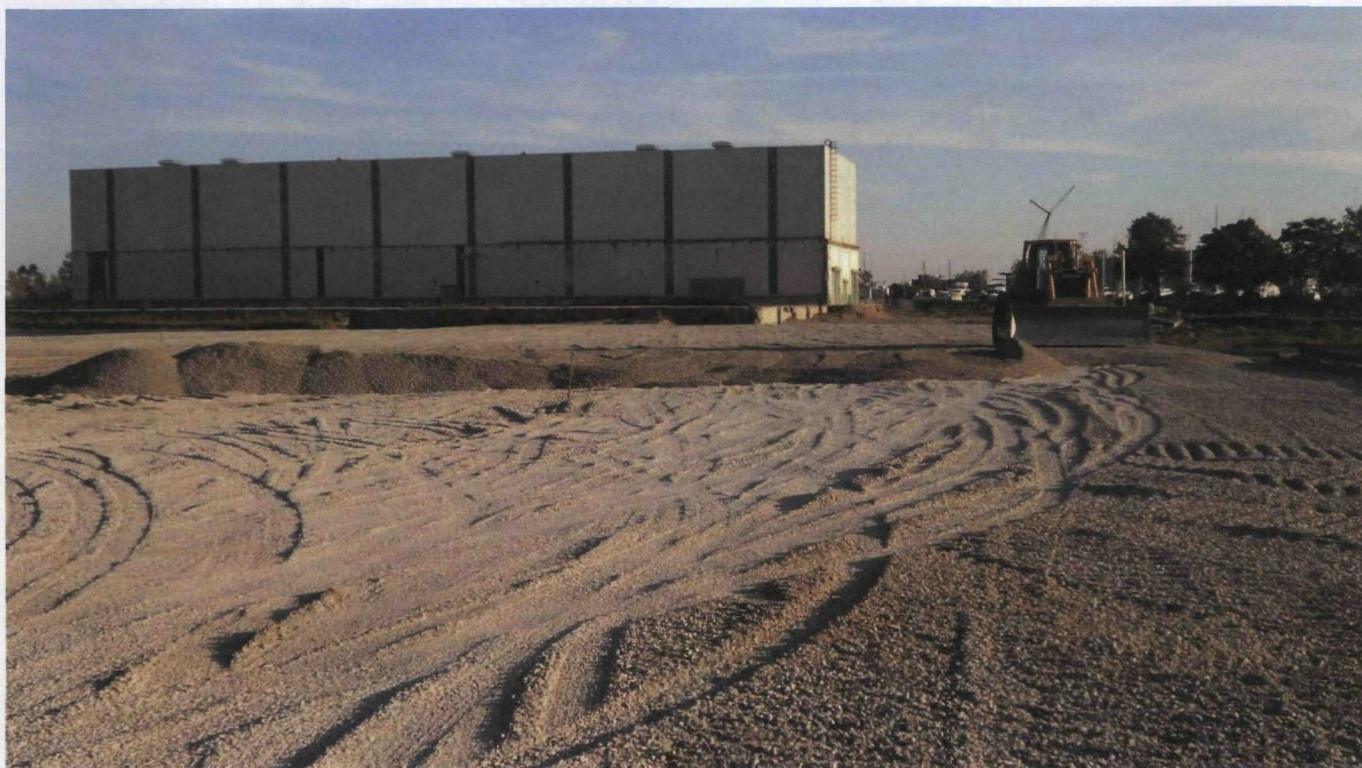
1. Trucks Dumping



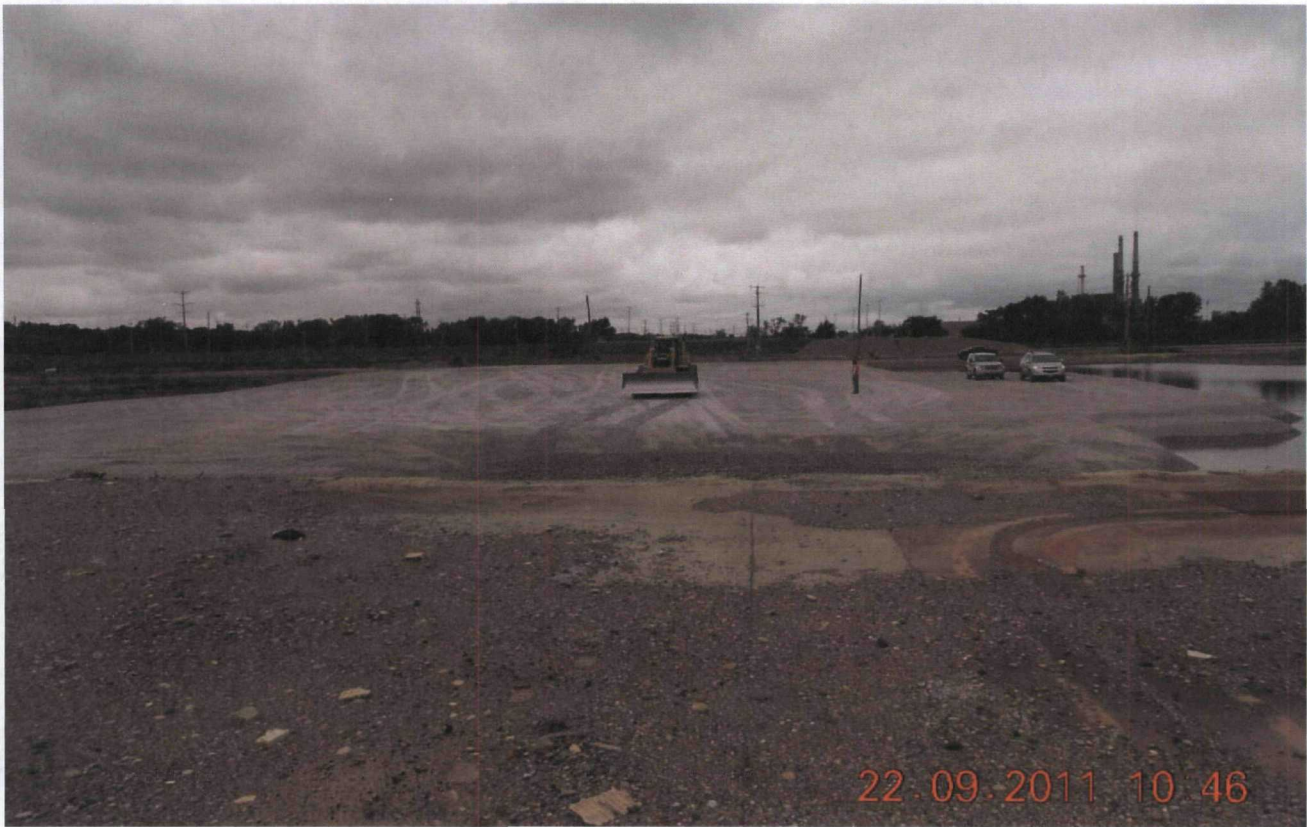
2. Pad Looking North



3. Pad Looking North



4. Spreading 1-foot Lift



5. Completed Pad Looking North



6. Containment Berm, Silt, and Snow Fence



7. Completed Containment Berm, Silt, and Snow Fence



8. Mix Area



9. Drill Rig



10. Mix Tank



11. Mix Tank Mixers



12. Drill head installed



13. Bentonite Super Sack and ZVI Silo



14. Auger Attached to Rig



15. ZVI Super Sacks



16. Batch Plant Progress



17. Drilling Column D-49



18. Progress and Spoils Management



19. ZVI Storage and Soil Mixing Pad



20. Soil Mixing Progress Looking E



21. Night Loading Bentonite



22. New Batch Plant and Pump



23. New Setup ZVI Silo into Batch Plant



24. Soil Mixing Progress Looking N



25. Soil Mixing Progress Looking SW



26. Batch Plant Looking W



27. Soil Mixing Progress Looking NE



28. Soil Mixing Progress Looking N



29. Soil Mixing Progress Looking SW



30. Soil Mixing Progress Looking N



31. Soil Mixing Progress Looking SW



32. Finished Soil Mixing Area Looking N



33. Removing Counterweight



34. Batch Plant and Silo Demobilization



35. Consolidation



36. Delmag Demobilization



37. Final Mix Area Looking SE



38. Consolidating Mix Area



39. Consolidation



40. Grading



41. Geotextile Placement and Sewing



42. Fill Placement



43. *Finishing Fill Placement and Grading*

**Appendix B**  
**Geo-Solutions, Inc., Closeout Report/Soil Mixing Job**  
**Summary**

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**Geo-Solutions**  
Soil & Groundwater Problems Solved.

1250 Fifth Avenue, New Kensington, PA 15068  
T 724-335-7273 F 724-335-7271  
[www.geo-solutions.com](http://www.geo-solutions.com)

January 26, 2012

P-554

CH2M Hill Constructors  
135 South 84th Street - Suite 400  
Milwaukee, WI 53214  
Attn: Jeff Lamont

**Close-Out Report / Soil Mixing Job Summary  
OMC Plant 2 Superfund Site  
TCE Impacted Zone  
Waukegan, IL**

**Introduction**

Geo-Solutions has completed the In Situ Treatment portions of the OMC Plant 2 Superfund Site remediation by following the requirements set forth in the specifications, drawings, contract, and subsequent verbal amendments. The largest portion of GSI's scope of work was soil mixing for the *in situ* treatment of TCE impacted soils with zero valent iron (ZVI) and bentonite, which is the subject of this report. Remaining work items to be completed under this contract include; capping of the treatment and spoils area, installation of a perimeter chain link fence, and other surface restoration.

**Milestone Dates**

Milestone dates: Geo-Solutions began mobilization on October 25, 2011. Soil mixing began on November 5, 2011. A second shift was started on November 16, 2011. Soil mixing was completed on December 7, 2011. Demobilization began on December 8, 2011. Demobilization was complete on December 13, 2011.

**Quality Control**

Quality control reports were completed daily for each shift and submitted for the duration of the project. These reports documented, at a minimum, completed columns, a summary of daily activities, conversations, safety, delays, and personnel onsite, actual top and bottom elevations for each column, target and actual slurry (in gallons), target and actual ZVI used in each column, the number of mixing strokes in each column, whether or not a sample was collected in each column, density and viscosity of the slurry, total lbs of bentonite and ZVI delivered to the site, total lbs of cement and ZVI used per day, and total gallons of water used per day. During the course of the soil mixing work, GSI installed two hundred and twenty four 9' diameter columns. 612,000 lbs of ZVI was delivered to the site. 609,000 lbs of the delivered ZVI was mixed with ~8,981 CYs of soil for a total of 67.8 lbs/CY or an addition rate

of 2.4% (assuming an *in situ* soil density of 103.7 pcf) . Delivery tickets are included as an appendix to this report and a summary is shown on Table 1 below.

**Table 1. ZVI Delivery Summary**

Delivery Date	Truck ID#	Total Lbs.
11/2/2011	43493	45000
11/2/2011	43494	45000
11/2/2011	43495	45000
11/12/2011	43519	45000
11/14/2011	43520	45000
11/16/2011	43521	45000
11/17/2011	43548	45000
11/23/2011	43565	45000
11/29/2011	43574	45000
12/1/2011	43596	45000
12/1/2011	43595	45000
12/2/2011	43600	45000
12/6/2011	43601	27000
12/6/2011	43608	45000

Please refer to the daily quality control reports for ZVI quantities delivered to each column.

Approximately 393,250 lbs of bentonite was delivered to the site. 332,750 lbs of the delivered bentonite was mixed with ~8,981 CYs of soil for a total of 37.1 lbs/CY or an addition rate of 1.3% (assuming an *in situ* soil density of 103.7 pcf) . Delivery tickets are included as an appendix to this report and a summary is shown on Table 2 below.

**Table 2. Bentonite Delivery Summary**

Delivery Date	Order#	Total Lbs.
10/31/2011	00064772	46700
11/3/2011	LU00064773	46680
11/7/2011	00064774	46760
11/14/2011	00064776	46760
11/14/2011	00064777	46720
11/14/2011	00064775	46720
12/2/2011	009182*	20000
12/5/2011	NA**	46750
12/6/2011	00064778	46720

\*This load of bentonite was supplied by a local drilling supplier in 50 lb bags

\*\*This load of bentonite was shipped from another GSI project

Please refer to the daily quality control reports for bentonite quantities delivered to each column.

GSI collected samples of recently treated soils at a minimum frequency of one location per day and at a minimum of two depths within each column. Collected samples were then given to CH2M Hill's onsite representative for magnetic separation testing. The magnetic separation testing was used to determine if 1) the minimum amount of ZVI was added to each column and 2) the ZVI was evenly distributed throughout the column. Please refer to CH2M Hill's reports for the results of the magnetic separation tests performed on this project.

### **Construction Photographs**

Construction photographs taken by GSI personnel during the course of the soil mixing work will be sent electronically along with this report and should be considered an appendix to this report.

### **Survey**

At the request of CH2M Hill, GSI established three new control points in locations that will remain during the remaining construction anticipated at this site. These control points may be used to locate the extents of the soil mixing zone for the purposes of deed restrictions and future site uses. Photographs of the physical locations and northings, eastings, and elevations of the established control points are shown in Figure 1 below.

*GSI CP 1*

GSI CP 1 is a bolt located on the asphalt near the southeastern corner of the existing site treatment building (below).



Northing: 2078271.26  
Easting: 1122444.66  
Elevation (MSL): 585.12

*GSI CP 2*

GSI CP 2 is a bolt located on the cement well protector on the eastern side of the western PCB containment mound (below).



Northing: 2078362.94  
Easting: 1122346.59  
Elevation (MSL): 601.27

*GSI CP 3*

GSI CP 3 is a bolt located on the cement well protector sitting near the existing site treatment building (below).



Northing: 2078275.57  
Easting: 1122425.15  
Elevation (MSL): 588.08

A scaled pdf drawing showing these points relative to the soil mix columns and soil mix treatment extents is included in an appendix to this report. Additionally, Autocad files with the column centerpoints and the established control points will be sent electronically alongside this report and should be considered an appendix to this report.



## Geo-Solutions

### Conclusions

Geo-Solutions enjoyed the opportunity to work with CH2M Hill on this interesting and challenging project. GSI looks forward to future opportunities with CH2M Hill and specifically opportunities with the team on this project.

Please feel free to call with questions or concerns,

Respectfully,  
**Geo-Solutions, Inc.**

Daniel Ruffing  
Assistant Project Manager

Ken Andromalos, P.E.  
Technical Director

### **List of Appendices** (all appendices are located on the CD on the inside back cover of this report)

ZVI Delivery Tickets

Bentonite Delivery Tickets

Closeup As-Built Soil Mixed Layout

PDF and Autocad Files Showing Control Points Relative to Soil Mix Columns

PDF and Autocad Files Showing the Mix Area Relative to Soil Mix Impacted Area

Appendix C  
Geo-Solutions, Inc., Daily Quality Control Reports

Appendix C is located on the CD on the inside back cover of this report.

Appendix D  
Cleanup Status Report

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# Cleanup Status Report OMC Plant 2 Site (OU4)—In Situ Soil Mixing WA No. 151-RARA-0528 / Contract No. EP-S5-06-01

PREPARED FOR: Timothy Drexler/USEPA  
PREPARED BY: CH2M HILL  
DATE: August 31, 2012  
PROJECT NUMBER: 422807.CV.01

## Introduction

This memorandum documents the field activities and results to monitor the performance of the in situ soil mixing (ISSM) component of the groundwater remedy at the Outboard Marine Corporation (OMC) Plant 2 site in Waukegan, Illinois. The cleanup validation activities included baseline and post-mixing soil sampling, installation of two temporary monitoring wells, and collection of field measurements and water samples from the temporary monitoring wells. The soil and water samples were submitted to a laboratory in the U.S. Environmental Protection Agency's (USEPA's) Contract Laboratory Program (CLP) to be analyzed for volatile organic compounds (VOCs). Additionally, water samples were sent to an independent laboratory to be analyzed for chloride, ethane, ethylene, and methane. The baseline and post-mixing results will document the overall effectiveness of ISSM to treat the trichloroethylene (TCE) dense nonaqueous phase liquid (DNAPL). Because the monitoring wells in and around the mix area were abandoned as part of the soil cleanup, groundwater samples were not collected prior to the mixing. A second round of water samples was collected in June 2012, 4 months after the installation of the temporary wells in 2012, to monitor changes in the TCE concentrations within the mixed area over time.

This memorandum presents the following:

- Description of sampling activities, including locations, methods, and deviations from site-specific plans
- Summary of samples collected, depths, field measurements, and observations at each location
- Summary of the analytical results, included in Attachment 1
- Data validation and usability evaluation, included in Attachment 1

## Field Activities

The field activities and their specific objectives are as follows:

- Collecting baseline and post-mixing soil samples to assess the effectiveness of ISSM to treat the reduce TCE concentrations.
- Installing two 1-inch-diameter temporary monitoring wells within the mixed area.
- Measuring field parameters, including temperature, specific conductance, dissolved oxygen (percent of saturation and milligrams per liter), pH, oxidation-reduction potential, and turbidity to establish water quality conditions after completion of the ISSM activities.
- Collecting water samples from the temporary monitoring wells to characterize quality conditions within the mix area.

## ISSM Baseline and Post-Mixing Soil Sampling

The baseline soil samples were collected in accordance with the site-specific quality assurance project plan (QAPP), specifically as described in Field Operating Procedure (FOP) No. 3 – *ISSM QA/QC and Baseline Soil*

*Sampling and FOP No. 5 – Volatile Organic Compound Soil Sampling* (CH2M HILL 2011). The baseline samples were collected throughout the course of mixing with the first collected on November 10, 2011, and the last on December 7, 2011. The samples were collected at a frequency of one location per 1,000 cubic yards of mixed soil and from a bottom and middle depth interval at each location (Figure 1). Twenty baseline soil samples from 10 locations were sent to a CLP laboratory to be analyzed for VOCs, and the preliminary data were reported on 72-hour turnaround time.

The post-mix soils were sampled on February 7 and 8, 2012, approximately 2 months following the completion of the mixing. Sampling was completed using direct-push technology and from approximately the same locations and depths as the baseline event. Samples were also submitted for VOC analysis with the preliminary results reported on a standard 21-day turnaround time. The soil samples were collected as described in *FOP No. 5 – Volatile Organic Compound Soil Sampling* and *FOP No. 6 – Direct Push Soil Sample Collection* (CH2M HILL 2011).

Quality assurance/quality control samples included trip blanks, a field duplicate, and matrix spike/matrix spike duplicate samples. The VOC analyses were performed by a CLP laboratory using USEPA CLP Method SOM01.2.

Samples were kept on ice until processed, packaged, and shipped to the laboratory. Sample handling, packaging, shipping, and documentation were performed as described in *FOP No. 07 – Sample Handling, Packaging, and Shipment* and *No. 8 – Documentation/Chain-of-Custody Procedures* (CH2M HILL 2011).

## Temporary Monitoring Well Installation

Two temporary monitoring wells were installed within the mix area on February 7, 2012, approximately 2 months following the completion of mixing (Figure 1). The wells were located based on the results from the soil sampling to represent different portions of the mixed area and range of TCE concentrations. Because the higher TCE concentrations were detected in the soil from the bottom interval, the wells were screened at the base of the aquifer (about 30 feet below ground surface). The wells were constructed using direct-push technology methods using 2-inch tooling and a 1-inch casing with a pre-packed 10-foot screen. Wells were sealed using bentonite chips and capped with j-plugs. Wells were developed using surge and purge methods until over 10 well volumes were removed. Purge water was containerized in a 55-gallon Department of Transportation drum and characterized by the drilling subcontractor for disposal.

## ISSM Performance Well Sampling

Water sampling of two temporary performance wells located within the treatment area was performed on February 7 and 8, 2012, and June 7, 2012, approximately 2 months and 6 months post-mixing, respectively. The results of the samples will be used to monitor the changes in the concentrations over time following the soil mixing activities.

Sampling was completed as described in *FOP No. 1 – Low Flow Groundwater Sampling Procedures* (CH2M HILL 2011).

The peristaltic pump with 0.25-inch ID Teflon-lined tubing using low-flow purging and sampling procedures provided representative water samples while minimizing the volume of purge water generated. The peristaltic pump connected to a 12-volt power supply was used to pump the water to the surface while the inlet tubing was situated approximately mid-screen. Field parameters, including depth to water, pH, specific conductance, conductivity, temperature, dissolved oxygen, and turbidity, were measured at 5-minute intervals using a YSI 650MDS multiprobe meter and sonde mounted in a sealed flow-through cell. The flow rate was also measured to maintain a rate of less than 500 milliliters per minute. The wells were purged continuously until monitored field parameters stabilized within the limits specified in *FOP No. 1 – Low Flow Groundwater Sampling Procedures* (CH2M HILL 2011). A summary of the final field parameters is presented in Table 1.

TABLE 1  
Temporary Monitoring Well Final Field Parameters  
OMC Plant 2 Site

Parameter	Units	TW-001 2/7/2012	TW-001 6/7/2012	TW-002 2/8/2012	TW-002 6/7/2012
Depth to Water	Feet	8.50	7.29	7.35	6.72
Dissolved Oxygen	Percent	-	3.97	-	0.6
Dissolved Oxygen	mg/L	0.58	3.85	0.41	0.06
Oxidation-Reduction Potential	Millivolts	-436.7	-493.5	-379.7	-410.6
pH	pH units	7.05	6.76	8.47	9.55
Specific Conductance	µS/cm	4,640	11,920	1,678	1,411
Temperature	Degrees Celsius	8.97	14.86	10.35	13.23
Turbidity	NTU	-	0	-	7.3

mg/L = milligrams per liter

µS/cm = microsiemens per centimeter

NTU = nephelometric turbidity unit

Trip blanks, a field duplicate, and matrix spike/matrix spike duplicate samples were collected for quality assurance/quality control. The samples were submitted to the CLP laboratory to be analyzed for VOCs. Additional samples were submitted to an independent laboratory to be analyzed for chloride, ethane, ethylene, and methane, for the two-month event only.

Samples were kept on ice until processed, packaged, and shipped to the laboratory. Sample handling, packaging, shipping, and documentation were performed as described in FOP No. 07 – *Sample Handling, Packaging, and Shipment* and No. 8 – *Documentation/Chain-of-Custody Procedures* (CH2M HILL 2011).

## Sampling Results

The analytical results for the soil and groundwater sampling are provided in Attachment 1. The results relative to the effectiveness of the ISSM to treat the TCE is briefly presented in the following subsections. Additional discussion is included in the *Remedial Action Construction Completion Report* (CH2M HILL 2012).

### ISSM Baseline and Post-Mixing Soil Sampling

Table 2 summarizes the TCE concentrations and percent reduction between baseline and post-mixing soil samples. Soil analytical results confirm that on average over 99 percent reduction in site-related VOCs was achieved when comparing baseline and post-mixing TCE

TABLE 2  
Soil TCE Concentrations and Reduction Percentages  
OMC Plant 2 Site

Column ID	Baseline (µg/kg)	2-month (µg/kg)	Percent Reduction
B47	8,200	6	99.93%
G42	24,500	47	99.81%
C38	14,000	3	99.98%
J31	40,500	27	99.93%
N27	16,500	172	98.96%
D29	73,500	145	99.80%
I20	110,000	236	99.79%
G14	195,000	665	99.66%
K8	720,000	870	99.88%
F5	93,000	640	99.31%

Note:

Concentrations shown are average of bottom sample and middle sample results.

µg/kg = micrograms per kilogram

results and no further soil sampling in the ISSM area is warranted. Figure 1 shows the locations and results of the soil samples by column and sample identification number within the ISSM treatment area.

### ISSM Performance Well Sampling

Table 3 provides the summary of the TCE concentrations from the post-mixing temporary monitoring well sampling conducted approximately two months and six months following the completion of mixing activities. Water analytical results confirm the presence of TCE in the mixing area. However, a small reduction of TCE at TW-001 and a significant reduction of TCE at TW-002 (see Figure 1) occurred between the 2-month and 6-month sampling events. Installation of permanent monitoring wells and water sampling around the ISSM area will be conducted as part of future sitewide groundwater monitoring efforts.

TABLE 3  
Groundwater TCE Contaminant Reduction Percentages  
OMC Plant 2 Site

Sample/Column ID	2-month (µg/L)	6-month (µg/L)	Percent Reduction
TW-001 (K8)	730,000J	540,000	26%
TW-002 (D29)	23,000	1.8J	99.99%

µg/L = micrograms per liter

J = Estimated Result

## Data Management and Evaluation

USEPA software FORMS II Lite 5.1 or Scribe ver. 3.5 Build 5 was used to enter field sample data and create sample tags and chain-of-custody forms. The FORMS II Lite or Scribe ver. 3.5 Build 5 database was used to enter sample information into the sample tracking spreadsheet. Upon analysis of the samples, the laboratory transmitted the analytical data and all supporting documentation to the USEPA for validation, after which, an electronic analytical report and an electronic and hard copy validation report was sent to CH2M HILL. Following USEPA data validation, a CH2M HILL project chemist reviewed the validation summaries, and the qualifiers were entered into the EQUIS database for use by the project team. CH2M HILL's data usability evaluation is provided in Attachment 1.

## References

CH2M HILL. 2011. *OMC Plant 2 Site Quality Assurance Project Plan*. "Remediation of Groundwater and Dense Nonaqueous Phase Liquid." WA No. 105-RARA-0528 Contract No. EP-S5-06-01.

CH2M HILL. 2012. *OMC Plant 2 Site (OU4) In Situ Soil Mixing Remedy*. "Draft Remedial Action Construction Completion Report." WA No. 151-RARA-0528 Contract No. EP-S5-06-01.

Figure 1

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F5	SO-010-B		SO-010-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	520 U	5.4 U	530 U	5.5 U
CIS-1,2-DICHLOROETHYLENE	15,000	3.5 J	13000	5 J
TRICHLOROETHYLENE	96000	780	90000	500

G14	SO-008-B		SO-008-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	1700 U	5.3 U	1600 U	5.2 U
CIS-1,2-DICHLOROETHYLENE	2400	8.3	3000	2.7 J
TRICHLOROETHYLENE	180000	820	210000	510

D29	SO-006-B		SO-006-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	680 U	5.5 U	730 U	6.1 U
CIS-1,2-DICHLOROETHYLENE	3100	19	2900	26
TRICHLOROETHYLENE	81000 J	89	66000	200

D29	TW-002		
	Baseline	Two-Month	Six-Month
VINYL CHLORIDE, µg/L	NA	250 U	0.87 J
CIS-1,2-DICHLOROETHYLENE, µg/L	NA	48000	58
TRICHLOROETHYLENE, µg/L	NA	23000	1.8 J
CHLORIDE (AS CL), mg/L	NA	470	NA
ETHANE, µg/L	NA	3000 J	NA
ETHYLENE, µg/L	NA	5900 J	NA
METHANE, µg/L	NA	110 J	NA

C38	SO-003-B		SO-003-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	63 U	5.2 U	63 U	5.2 U
CIS-1,2-DICHLOROETHYLENE	940	7.3	850	6.7
TRICHLOROETHYLENE	16000	2.8 J	12000 J	4 J

B47	SO-001-B		SO-001-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	62 U	5.2 U	64 U	6.1 U
CIS-1,2-DICHLOROETHYLENE	2000	8.2	3300	2.4 J
TRICHLOROETHYLENE	5400	5.2 U	11000	6.1 U

K8	TW-001		
	Baseline	Two-Month	Six-Month
VINYL CHLORIDE, µg/L	NA	2500 U	20000 UJ
CIS-1,2-DICHLOROETHYLENE, µg/L	NA	28000	20000 U
TRICHLOROETHYLENE, µg/L	NA	730000 J	540000
CHLORIDE (AS CL), mg/L	NA	1700 J	NA
ETHANE, µg/L	NA	3800	NA
ETHYLENE, µg/L	NA	7700	NA
METHANE, µg/L	NA	110	NA

K8	SO-009-B		SO-009-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	8400 U	5.2 U	7400 U	6.3 U
CIS-1,2-DICHLOROETHYLENE	8400 U	15	7400 U	6.3 U
TRICHLOROETHYLENE	690000	930	750000	810

I20	SO-007-B		SO-007-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	680 U	5.5 U	600 U	5 U
CIS-1,2-DICHLOROETHYLENE	2400	6	1900	16
TRICHLOROETHYLENE	120000 J	380	100000	91

N27	SO-005-B		SO-005-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	300 U	6.1 U	320 U	6.6 U
CIS-1,2-DICHLOROETHYLENE	2400	110	2700	19
TRICHLOROETHYLENE	17000	340	16000	3.2 J

J31	SO-004-B		SO-004-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	60 U	5.6 U	57 U	5.5 U
CIS-1,2-DICHLOROETHYLENE	920 J	5.6 U	610 J	4.1 J
TRICHLOROETHYLENE	53000	42	28000	11

G42	SO-002-B		SO-002-M	
	Baseline	Two-Month	Baseline	Two-Month
VINYL CHLORIDE	63 U	5.2 U	63 U	5.7 U
CIS-1,2-DICHLOROETHYLENE	1400	150	3400	20
TRICHLOROETHYLENE	15000	89	34000	5.7 U

Legend

- Sample Collected For Soil VOC Analysis Only
- ⊗ Sample Collected For Soil and Groundwater VOC Analysis

Notes:

All results in micrograms per kilogram, unless otherwise noted.  
Temporary monitoring wells installed at locations K08 and D29.  
B - Bottom Depth Sample  
M - Mid Depth Sample

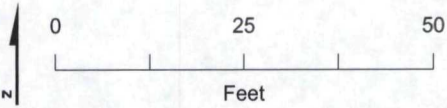


Figure 1  
VOC Sampling Results  
OMC Plant 2 ISSM  
Waukegan, IL

Attachment 1  
Data Usability Evaluation Memorandums

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November and December 2011

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# Data Usability Evaluation—November and December 2011 OMC Plant 2 Site, Waukegan, Illinois WA No. 151-RARA-0528, Contract No. EP-S5-06-01

PREPARED FOR: U.S. Environmental Protection Agency

PREPARED BY: Adrienne Korpela/CH2M HILL

DATE: February 21, 2012

This memorandum presents the results of the data usability evaluation of soil data from the Outboard Marine Corporation (OMC) Plant 2 site in Waukegan, Illinois. Soil samples were collected in November and December 2011 and analyzed by a laboratory in the U.S. Environmental Protection Agency's (USEPA's) Contract Laboratory Program (CLP). The analytical results will be used to evaluate the effectiveness of the in situ soil mixing component of the TCE DNAPL remedy.

A total of 22 soil samples, including quality control (QC) samples, were analyzed as shown in Table 1.

TABLE 1  
Analytical Parameters  
*OMC Plant 2*

Parameter	Method	Laboratory
Volatile organic compounds	CLP SOW SOM01.2	KAP Technologies, Inc. The Woodlands, Texas

As part of the quality assurance process outlined in the site-specific quality assurance project plan (CH2M HILL 2011), QC samples were collected in the field to complement the assessment of overall data quality and usability. The QC samples consisted of field duplicates and aliquots for laboratory matrix spike/matrix spike duplicates.

USEPA's Environmental Service Assistance Team contractor, TechLaw (Attachment 1), reviewed the data set from the laboratory to assess the accuracy and precision of the method and the matrix using criteria established in the National Functional Guidelines and verified that the data set was complete. USEPA validators also added data qualifiers when the QC statistics indicated a possible bias to specific compounds or analytes associated with a particular method and sample batch.

Standard data qualifiers are a means to classify these data with regard to their conformance to QC requirements. The applied data qualifiers are defined as follows:

- [U] The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- [J] The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- [J+] The result is an estimated quantity, but the result may be biased high.
- [J-] The result is an estimated quantity, but the result may be biased low.
- [UJ] The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- [R] The data are unusable. The sample results are rejected due to serious deficiencies in meeting Quality Control (QC) criteria. The analyte may or may not be present in the sample.

CH2M HILL reviewed the validation performed by USEPA for the groundwater samples in Case Number 41921, sample delivery groups E4KP0, E4KP4, and E4KQ1. Table 2 presents the sample identifications (IDs) and station locations that were reviewed (100 percent of all samples collected).

TABLE 2  
Sample Summary by Sample ID and Location  
*OMC Plant 2*

Organic Sample ID	Location	Organic Sample ID	Location	Organic Sample ID	Location
E4KP0	OMC-SO-001-B	E4KP8	OMC-SO-004-M	E4KQ6	OMC-SO-008-B
E4KP1	OMC-SO-001-M	E4KP9	OMC-SO-005-B	E4KQ7	OMC-SO-008-M
E4KP2	OMC-SO-002-M	E4KQ0	OMC-SO-005-M	E4KQ8	OMC-SO-009-B
E4KP3	OMC-SO-002-B	E4KQ1	OMC-SO-006-B	E4KQ9	OMC-SO-009-M
E4KP4	OMC-SO-003-B	E4KQ2	OMC-SO-006-M	E4KR0	OMC-SO-010-B
E4KP5	OMC-SO-003-M	E4KQ3	OMC-SO-007-B	E4KR2	OMC-SO-010-M
E4KP6	OMC-SO-004-B	E4KQ4	OMC-SO-007-M	-	-
E4KP7	OMC-SO-004-B (FD)	E4KQ5	OMC-SO-007-M (FD)	-	-

FD = field duplicate

The USEPA validation case narratives and worksheets indicate that some sample results should be qualified as biased based on the applicable QC limits or other National Functional Guidelines requirements. The narratives and worksheets are presented in Attachment 1.

## Findings

The following sections summarize the data validation findings and usability of the final reportable results. The sample numbers and locations summarized below do not include the quality assurance/QC samples.

### Volatile Organic Compound Data

The VOC data set consists of the results for 52 analytes from 20 soil samples collected at 10 locations, resulting in 1040 results.

The data validation summary indicates the following:

- U, UJ, and J qualifiers were applied to sample results that were potentially affected by QC deficiencies.
- J qualifiers were applied to sample results that were reported between the method detection limit and the reporting limit.
- None of the reported VOC results were rejected.

One hundred percent of the VOC data, as qualified, can be used to make project decisions.

### Conclusions

The final activity in the data quality evaluation is an assessment of whether the data meet the data quality objectives. The goal of the assessment was to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision making process. The following summary highlights the data evaluation findings for the above-defined events:

1. The completeness objective of 90 percent was met for all method/analyte combinations.

2. The precision and accuracy of the data, as measured by field and laboratory QC indicators, indicate that the data quality objectives were met.

The data summary tables are included at the end of this document.

## Reference Cited

CH2M HILL. 2011. *Quality Assurance Project Plan, OMC Plant 2 Site, Waukegan, Illinois*. WA No. 074-RARA-0528 Contract No. EP-S5-06-01. February.

USEPA. 2008. *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*. June.

## Tables

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# Baseline In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

November/December 2011

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 001-B B-47 18 - 19 11/10/2011	OMC-SO- 001-M B-47 10 - 11 11/10/2011	OMC-SO- 002-B G-42 18 - 19 11/11/2011	OMC-SO- 002-M G-42 10 - 11 11/11/2011	OMC-SO- 003-B C-38 18 - 19 11/21/2011	OMC-SO- 003-M C-38 9 - 10 11/21/2011
<b>Volatile Organic Compounds</b>							
1,1,1-TRICHLOROETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
1,1,2,2-TETRACHLOROETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
1,1,2-TRICHLOROETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
1,1-DICHLOROETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
1,1-DICHLOROETHYLENE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 UJ
1,2,3-TRICHLOROBENZENE	UG/KG	38 J	64 U	63 U	63 U	63 U	63 U
1,2,4-TRICHLOROBENZENE	UG/KG	31 J	64 U	63 U	63 U	63 U	63 U
1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
1,2-DICHLOROBENZENE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
1,2-DICHLOROETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
1,2-DICHLOROPROPANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
1,4-DICHLOROBENZENE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
1,4-DIOXANE (P-DIOXANE)	UG/KG	1200 U	1300 U	1300 U	1300 U	1300 U	1300 U
ACETONE	UG/KG	120 U	130 U	130 U	130 U	130 U	130 U
BENZENE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
BROMODICHLOROMETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
BROMOMETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 UJ
CARBON DISULFIDE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 UJ
CARBON TETRACHLORIDE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
CFC-11	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
CFC-12	UG/KG	62 U	64 U	63 U	63 U	63 U	63 UJ
CHLORINATED FLUOROCARBON (FREON 113)	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
CHLOROBENZENE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
CHLOROBROMOMETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
CHLORODIBROMOMETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 U
CHLOROETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U	63 UJ

# Baseline In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

November/December 2011

Waukegan, Illinois

Station ID	OMC-SO-001-B	OMC-SO-001-M	OMC-SO-002-B	OMC-SO-002-M	OMC-SO-003-B	OMC-SO-003-M
Column ID	B-47	B-47	G-42	G-42	C-38	C-38
Depth	18 - 19	10 - 11	18 - 19	10 - 11	18 - 19	9 - 10
Sample Date	11/10/2011	11/10/2011	11/11/2011	11/11/2011	11/21/2011	11/21/2011
CHLOROFORM	UG/KG	62 U	64 U	63 U	63 U	63 U
CHLOROMETHANE	UG/KG	62 U	64 U	63 U	63 U	63 UJ
CIS-1,2-DICHLOROETHYLENE	UG/KG	2000	3300	1400	3400	940
CIS-1,3-DICHLOROPROPENE	UG/KG	62 U	64 U	63 U	63 U	63 U
CYCLOHEXANE	UG/KG	62 U	64 U	63 U	63 U	63 U
DICHLOROMETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U
ETHYLBENZENE	UG/KG	62 U	64 U	63 U	63 U	63 U
ISOPROPYLBENZENE (CUMENE)	UG/KG	62 U	64 U	63 U	63 U	63 U
M,P-XYLENE (SUM OF ISOMERS)	UG/KG	62 U	64 U	63 U	63 U	63 U
M-DICHLOROBENZENE	UG/KG	62 U	64 U	63 U	63 U	63 U
METHYL ACETATE	UG/KG	62 U	64 U	63 U	63 U	63 U
METHYL ETHYL KETONE (2-BUTANONE)	UG/KG	120 U	130 U	130 U	130 U	130 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/KG	120 U	130 U	130 U	130 U	130 U
METHYL N-BUTYL KETONE	UG/KG	120 U	130 U	130 U	130 U	130 U
METHYLBENZENE	UG/KG	62 U	64 U	27 J	63 U	63 U
METHYLCYCLOHEXANE	UG/KG	62 U	64 U	82	63 U	63 U
O-XYLENE (1,2-DIMETHYLBENZENE)	UG/KG	62 U	64 U	63 U	63 U	63 U
STYRENE (MONOMER)	UG/KG	62 U	64 U	63 U	63 U	63 U
TERT-BUTYL METHYL ETHER	UG/KG	62 U	64 U	63 U	63 U	63 U
TETRACHLOROETHYLENE(PCE)	UG/KG	62 U	64 U	63 U	63 U	63 U
TRANS-1,2-DICHLOROETHENE	UG/KG	62 U	64 U	63 U	63 U	63 U
TRANS-1,3-DICHLOROPROPENE	UG/KG	62 U	64 U	63 U	63 U	63 U
TRIBOMOMETHANE	UG/KG	62 U	64 U	63 U	63 U	63 U
TRICHLOROETHYLENE	UG/KG	5400	11000	15000	34000	16000
VINYL CHLORIDE	UG/KG	62 U	64 U	63 U	63 U	12000 J

# Baseline In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

November/December 2011

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 004-B J-31 18 - 19 11/22/2011	OMC-SO- 004-B, dup J-31 18 - 19 11/22/2011	OMC-SO- 004-M J-31 10 - 11 11/22/2011	OMC-SO- 005-B N-27 19 - 20 11/28/2011	OMC-SO- 005-M N-27 10 - 11 11/28/2011	OMC-SO- 006-B D-29 20 - 21 12/1/2011
<b>Volatile Organic Compounds</b>							
1,1,1-TRICHLOROETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,1,2,2-TETRACHLOROETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,1,2-TRICHLOROETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,1-DICHLOROETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,1-DICHLOROETHYLENE	UG/KG	110	56 U	65	300 U	320 U	680 U
1,2,3-TRICHLOROBENZENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,2,4-TRICHLOROBENZENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,2-DICHLOROBENZENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,2-DICHLOROETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,2-DICHLOROPROPANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,4-DICHLOROBENZENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
1,4-DIOXANE (P-DIOXANE)	UG/KG	1200 U	1100 U	1100 U	6000 U	6400 U	14000 U
ACETONE	UG/KG	120 U	110 U	110 U	600 U	640 U	1400 U
BENZENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
BROMODICHLOROMETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
BROMOMETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CARBON DISULFIDE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CARBON TETRACHLORIDE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CFC-11	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CFC-12	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CHLORINATED FLUOROCARBON (FREON 113)	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CHLOROBENZENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CHLOROBROMOMETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CHLORODIBROMOMETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CHLOROETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U

# Baseline In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

November/December 2011

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 004-B J-31 18 - 19 11/22/2011	OMC-SO- 004-B, dup J-31 18 - 19 11/22/2011	OMC-SO- 004-M J-31 10 - 11 11/22/2011	OMC-SO- 005-B N-27 19 - 20 11/28/2011	OMC-SO- 005-M N-27 10 - 11 11/28/2011	OMC-SO- 006-B D-29 20 - 21 12/1/2011
CHLOROFORM	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CHLOROMETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CIS-1,2-DICHLOROETHYLENE	UG/KG	920 J	1600	610 J	2400	2700	3100
CIS-1,3-DICHLOROPROPENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
CYCLOHEXANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
DICHLOROMETHANE	UG/KG	60 U	56 U	57 U	600 U	640 U	680 U
ETHYLBENZENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
ISOPROPYLBENZENE (CUMENE)	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
M,P-XYLENE (SUM OF ISOMERS)	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
M-DICHLOROBENZENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
METHYL ACETATE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
METHYL ETHYL KETONE (2-BUTANONE)	UG/KG	120 U	110 U	110 U	600 U	640 U	1400 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/KG	120 U	110 U	110 U	600 U	640 U	1400 U
METHYL N-BUTYL KETONE	UG/KG	120 U	110 U	110 U	600 U	640 U	1400 U
METHYLBENZENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
METHYLCYCLOHEXANE	UG/KG	60 U	56 U	190	300 U	320 U	680 U
O-XYLENE (1,2-DIMETHYLBENZENE)	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
STYRENE (MONOMER)	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
TERT-BUTYL METHYL ETHER	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
TETRACHLOROETHYLENE(PCE)	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
TRANS-1,2-DICHLOROETHENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
TRANS-1,3-DICHLOROPROPENE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
TRIBOMOMETHANE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U
TRICHLOROETHYLENE	UG/KG	53000	32000	28000	17000	16000	81000 J
VINYL CHLORIDE	UG/KG	60 U	56 U	57 U	300 U	320 U	680 U

# Baseline In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

November/December 2011

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 006-M D-29 10 - 11 12/1/2011	OMC-SO- 007-B I-20 20 - 21 12/2/2011	OMC-SO- 007-M I-20 10 - 11 12/2/2011	OMC-SO- 007-M, dup I-20 10 - 11 12/2/2011	OMC-SO- 008-B G-14 20 - 21 12/5/2011	OMC-SO- 008-M G-14 10 - 11 12/5/2011
<b>Volatile Organic Compounds</b>							
1,1,1-TRICHLOROETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,1,2,2-TETRACHLOROETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,1,2-TRICHLOROETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,1-DICHLOROETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,1-DICHLOROETHYLENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,2,3-TRICHLOROBENZENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,2,4-TRICHLOROBENZENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,2-DICHLOROBENZENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,2-DICHLOROETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,2-DICHLOROPROPANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,4-DICHLOROBENZENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
1,4-DIOXANE (P-DIOXANE)	UG/KG	15000 U	14000 U	12000 U	12000 U	34000 U	32000 U
ACETONE	UG/KG	1500 U	1400 U	1200 U	1200 U	3400 U	3200 U
BENZENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
BROMODICHLOROMETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
BROMOMETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CARBON DISULFIDE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CARBON TETRACHLORIDE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CFC-11	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CFC-12	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CHLORINATED FLUOROCARBON (FREON 113)	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CHLOROBENZENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CHLOROBROMOMETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CHLORODIBROMOMETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CHLOROETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U

# Baseline In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

November/December 2011

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 006-M D-29 10 - 11 12/1/2011	OMC-SO- 007-B I-20 20 - 21 12/2/2011	OMC-SO- 007-M I-20 10 - 11 12/2/2011	OMC-SO- 007-M, dup I-20 10 - 11 12/2/2011	OMC-SO- 008-B G-14 20 - 21 12/5/2011	OMC-SO- 008-M G-14 10 - 11 12/5/2011
CHLOROFORM	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CHLOROMETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 UJ	1600 U
CIS-1,2-DICHLOROETHYLENE	UG/KG	2900	2400	1900	1800	2400	3000
CIS-1,3-DICHLOROPROPENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
CYCLOHEXANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
DICHLOROMETHANE	UG/KG	730 U	1400 U	1200 U	1200 U	1800	1100 J
ETHYLBENZENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
ISOPROPYLBENZENE (CUMENE)	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
M,P-XYLENE (SUM OF ISOMERS)	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
M-DICHLOROBENZENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
METHYL ACETATE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
METHYL ETHYL KETONE (2-BUTANONE)	UG/KG	1500 U	1400 U	1200 U	1200 U	3400 U	3200 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/KG	1500 U	1400 U	1200 U	1200 U	3400 U	3200 U
METHYL N-BUTYL KETONE	UG/KG	1500 U	1400 U	1200 U	1200 U	3400 U	3200 U
METHYLBENZENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
METHYLCYCLOHEXANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
O-XYLENE (1,2-DIMETHYLBENZENE)	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
STYRENE (MONOMER)	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
TERT-BUTYL METHYL ETHER	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
TETRACHLOROETHYLENE(PCE)	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
TRANS-1,2-DICHLOROETHENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
TRANS-1,3-DICHLOROPROPENE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
TRIBOMOMETHANE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U
TRICHLOROETHYLENE	UG/KG	66000	120000 J	100000	110000	180000	210000
VINYL CHLORIDE	UG/KG	730 U	680 U	600 U	620 U	1700 U	1600 U

# Baseline In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

November/December 2011

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 009-B K-8 20 - 21 12/5/2011	OMC-SO- 009-M K-8 10 - 11 12/5/2011	OMC-SO- 010-B F-5 20 - 21 12/7/2011	OMC-SO- 010-M F-5 11 - 12 12/7/2011
<b>Volatile Organic Compounds</b>					
1,1,1-TRICHLOROETHANE	UG/KG	8400 U	7400 U	520 U	530 U
1,1,2,2-TETRACHLOROETHANE	UG/KG	8400 U	7400 U	520 U	530 U
1,1,2-TRICHLOROETHANE	UG/KG	8400 U	7400 U	520 U	530 U
1,1-DICHLOROETHANE	UG/KG	8400 U	7400 U	520 U	530 U
1,1-DICHLOROETHYLENE	UG/KG	8400 U	7400 U	520 U	530 U
1,2,3-TRICHLOROBENZENE	UG/KG	8400 U	7400 U	520 U	530 U
1,2,4-TRICHLOROBENZENE	UG/KG	8400 U	7400 U	520 U	530 U
1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	UG/KG	8400 U	7400 U	520 U	530 U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	UG/KG	8400 U	7400 U	520 U	530 U
1,2-DICHLOROBENZENE	UG/KG	8400 U	7400 U	520 U	530 U
1,2-DICHLOROETHANE	UG/KG	8400 U	7400 U	520 U	530 U
1,2-DICHLOROPROPANE	UG/KG	8400 U	7400 U	520 U	530 U
1,4-DICHLOROBENZENE	UG/KG	8400 U	7400 U	520 U	530 U
1,4-DIOXANE (P-DIOXANE)	UG/KG	170000 U	150000 U	10000 U	11000 U
ACETONE	UG/KG	17000 U	15000 U	1000 U	1100 U
BENZENE	UG/KG	8400 U	7400 U	520 U	530 U
BROMODICHLOROMETHANE	UG/KG	8400 U	7400 U	520 U	530 U
BROMOMETHANE	UG/KG	8400 U	7400 U	520 U	530 U
CARBON DISULFIDE	UG/KG	8400 U	7400 U	520 U	530 U
CARBON TETRACHLORIDE	UG/KG	8400 U	7400 U	520 U	530 U
CFC-11	UG/KG	8400 U	7400 U	520 U	530 U
CFC-12	UG/KG	8400 U	7400 U	520 U	530 U
CHLORINATED FLUOROCARBON (FREON 113)	UG/KG	8400 U	7400 U	520 U	530 U
CHLOROBENZENE	UG/KG	8400 U	7400 U	520 U	530 U
CHLOROBROMOMETHANE	UG/KG	8400 U	7400 U	520 U	530 U
CHLORODIBROMOMETHANE	UG/KG	8400 U	7400 U	520 U	530 U
CHLOROETHANE	UG/KG	8400 U	7400 U	520 U	530 U

# Baseline In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

November/December 2011

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 009-B K-8 20 - 21 12/5/2011	OMC-SO- 009-M K-8 10 - 11 12/5/2011	OMC-SO- 010-B F-5 20 - 21 12/7/2011	OMC-SO- 010-M F-5 11 - 12 12/7/2011
CHLOROFORM	UG/KG	8400 U	7400 U	520 U	530 U
CHLOROMETHANE	UG/KG	8400 U	7400 U	520 U	530 U
CIS-1,2-DICHLOROETHYLENE	UG/KG	8400 U	7400 U	15000	13000
CIS-1,3-DICHLOROPROPENE	UG/KG	8400 U	7400 U	520 U	530 U
CYCLOHEXANE	UG/KG	8400 U	7400 U	520 U	530 U
DICHLOROMETHANE	UG/KG	7600 J	7400 U	1000 U	1100 U
ETHYLBENZENE	UG/KG	8400 U	7400 U	520 U	530 U
ISOPROPYLBENZENE (CUMENE)	UG/KG	8400 U	7400 U	520 U	530 U
M,P-XYLENE (SUM OF ISOMERS)	UG/KG	8400 U	7400 U	520 U	530 U
M-DICHLOROBENZENE	UG/KG	8400 U	7400 U	520 U	530 U
METHYL ACETATE	UG/KG	8400 U	7400 U	520 U	530 U
METHYL ETHYL KETONE (2-BUTANONE)	UG/KG	17000 U	15000 U	1000 U	1100 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/KG	17000 U	15000 U	1000 U	1100 U
METHYL N-BUTYL KETONE	UG/KG	17000 U	15000 U	1000 U	1100 U
METHYLBENZENE	UG/KG	8400 U	7400 U	520 U	530 U
METHYLCYCLOHEXANE	UG/KG	8400 U	7400 U	520 U	530 U
O-XYLENE (1,2-DIMETHYLBENZENE)	UG/KG	8400 U	7400 U	520 U	530 U
STYRENE (MONOMER)	UG/KG	8400 U	7400 U	520 U	530 U
TERT-BUTYL METHYL ETHER	UG/KG	8400 U	7400 U	520 U	530 U
TETRACHLOROETHYLENE(PCE)	UG/KG	8400 U	7400 U	520 U	530 U
TRANS-1,2-DICHLOROETHENE	UG/KG	8400 U	7400 U	520 U	530 U
TRANS-1,3-DICHLOROPROPENE	UG/KG	8400 U	7400 U	520 U	530 U
TRIBOMOMETHANE	UG/KG	8400 U	7400 U	520 U	530 U
TRICHLOROETHYLENE	UG/KG	690000	750000	96000	90000
VINYL CHLORIDE	UG/KG	8400 U	7400 U	520 U	530 U

Attachment 1  
Validation Narratives

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
SUPERFUND DIVISION

DATE:

SUBJECT: Review of Data  
Received for Review on: 2 December 2011

FROM: Timothy Prendiville, Supervisor (SR-6J)  
Superfund Contract Management Section

TO: Data User: CH2M Hill  
dshekosk@CH2M.com  
shannon.olson@CH2M.com

Level 3 Data Validation

We have reviewed the data for the following case:

SITE Name: Outboard Marine Corp - OMC (IL)

Case Number: 41921

SDG Number: E4KP0

Number and Type of Samples: 4 Soil Samples (Volatiles)

Sample Numbers: E4KP0-E4KP3

Laboratory: KAP Technologies

Hrs for Review:

Following are our findings:

CC: Howard Pham  
Region 5 TPO  
Mail Code: SA-5J

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

Page 2 of 8  
SDG Number: E4KP0  
Laboratory: KAP Technologies

**Below is a summary of the out-of-control audits and the possible effects on the data for this case:**

Four (4) soil samples labeled E4KP0-E4KP3, were shipped to KAP Technologies located in The Woodlands, TX. All samples were collected 11/10/11 and 11/11/11 and received 11/11/11 and 11/12/11 intact. Samples E4KP0 and E4KP1 arrived in a cooler with a temperature of 0.5°C. Samples E4KP2 and E4KP3 arrived in a cooler with a temperature of 1.6°C. Sample results are not qualified for this discrepancy.

All samples were analyzed for the volatile list of compounds. All samples were analyzed according to CLP SOW SOM01.2 (6/2007) and reviewed according to the NFG for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.6).

Sample E4KP1 was designated by the samplers to be used for laboratory QC, i.e. MS / MSD analyses.

No samples were identified as field blanks or field duplicates.

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

SDG Number: E4KP0  
Laboratory: KAP Technologies

**1. HOLDING TIME**

No Problems Found.

**2. GC/MS TUNING AND GC INSTRUMENT PERFORMANCE**

No Problems Found.

**3. CALIBRATION**

The following volatile samples are associated with an initial calibration percent relative standard deviation (%RSD) outside criteria. The compound was not detected in the samples. Non-detected compounds are not qualified unless qualified for another criteria.

E4KP0ME, E4KP1ME, E4KP2ME, E4KP3ME, VBLK32  
Bromomethane, 1,2,3-Trichlorobenzene

The following volatile samples are associated with an opening continuing calibration percent difference (%D) outside criteria. The compound was not detected in the samples. Non-detected compounds are qualified "UJ".

E4KP0ME, E4KP1ME, E4KP2ME, E4KP3ME, VBLK32  
1,2,4-Trichlorobenzene, 1,2,3-Trichlorobenzene

**4. BLANKS**

The following volatile samples have analyte concentrations reported less than the CRQL. The associated method blank concentration is less than the concentration criteria. Reported sample concentrations have been elevated to the CRQL and qualified "U".

E4KP0ME, E4KP1ME, E4KP2ME, E4KP3ME  
Toluene

The following volatile samples have common contaminant analyte concentrations reported less than 2x the CRQL. The associated method blank common contaminant concentration is less than 2x the concentration criteria. Detected compounds are qualified "U". Non-detected compounds are not qualified. Reported sample concentrations have been elevated to 2x the CRQL.

E4KP0ME, E4KP1ME, E4KP2ME, E4KP3ME  
Methylene chloride

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

SDG Number: E4KP0  
Laboratory: KAP Technologies

The following volatile samples have TIC concentrations reported less than 5X the method blank concentration. Detected compounds are qualified "U" and deleted from the TIC report. See Section 12 for more information.

Unknown @ 11.02;  
CAS No. 541-05-9 Cyclotrisiloxane, hexamethyl  
E4KP0ME, E4KP1ME, E4KP3ME, VHBLK01

Unknown @ 16.01  
VHBLK01

#### **5. DEUTERATED MONITORING COMPOUND AND SURROGATE RECOVERY**

The following volatile samples have DMC recoveries above the upper limit of the criteria window. The compounds were not detected in the sample. Non-detected compounds are not qualified.

E4KP1ME  
cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, 1,1,2-Trichloroethane

#### **6A. MATRIX SPIKE/MATRIX SPIKE DUPLICATE**

Sample E4KP1 was designated by the samplers to be used for laboratory QC, i.e. MS / MSD analyses.

The following volatile matrix spike/matrix spike duplicate samples have percent recoveries greater than the upper acceptance criteria. The compound was not detected in the sample. Non-detected compounds in the unspiked sample are not qualified.

E4KP1MS, E4KP1MSD  
Chlorobenzene

The following volatile matrix spike/matrix spike duplicate samples have percent recoveries that are less than the expanded lower acceptance limit. Detected compounds in the unspiked sample are qualified "J".

E4KP1MS, E4KP1MSD  
Trichloroethene

#### **6B. LABORATORY CONTROL SAMPLE**

Not applicable to volatile analyses.

#### **7. FIELD BLANK AND FIELD DUPLICATE**

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

SDG Number: E4KP0  
Laboratory: KAP Technologies

No samples were identified as field blanks or field duplicates.

#### 8. INTERNAL STANDARDS

No Problems Found.

#### 9. COMPOUND IDENTIFICATION

After reviewing the mass spectra and chromatograms it appears that all volatile compounds were properly identified.

#### 10. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS

During the data validation process, it has come to the attention of several reviewers that the data generated by the laboratory appears to have an error in the formula used to correct positive results in LOW LEVEL VOLATILE soils for sample size and percent moisture. The reported CRQLs and the results for TIC compounds are correct when using the formula as stated in the SOW SOM01.2. When the same formula is used to calculate the final results for detected compounds, the calculated results are one-half what is reported on the FORM Is or final result tables in EXES. This error is also duplicated with the blank results. It is the opinion of the reviewers that somewhere in the data reduction process at the laboratory an erroneous formula or data input is occurring.

The following volatile samples have analyte concentrations below the quantitation limit (CRQL). Detected compounds are qualified "J".

E4KP0  
1,2,4-Trichlorobenzene, 1,2,3-Trichlorobenzene

E4KP3  
Toluene

VBLK30  
Trichloroethene

VBLK32  
Methylene chloride, Toluene

VBLK34  
Toluene, 1,2,4-Trichlorobenzene, 1,2,3-Trichlorobenzene

A library search indicates a match below 85% for a TIC compound in the volatile sample. Detected compounds are qualified "J".

Unknown @ 11.02  
E4KP0, E4KP2ME, VBLK30, VBLK32, VBLK34, VBLK36

Reviewed by: Deborah Connet / Techlaw-ESAT  
Date: 12/30/2011

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

Page 6 of 8  
SDG Number: E4KP0  
Laboratory: KAP Technologies

Unknown @ 15.99  
E4KP1, E4KP1ME, E4KP2, E4KP2ME, E4KP3, VBLK36

A library search indicates a match at or above 85% for a TIC compound in the volatile sample. Detected compounds are qualified "NJ".

CAS No. 541-05-9 Cyclotrisiloxane, hexamethyl-  
E4KP0, E4KP1, E4KP2, E4KP3, VBLK32, VBLK34, VBLK36

## 11. SYSTEM PERFORMANCE

GC/MS baseline indicated acceptable performance.

## 12. ADDITIONAL INFORMATION

The following low level volatile samples have reported concentrations that exceed the instrument's linear calibration range. The results are flagged "E" by the laboratory and are estimated "J". The result from the medium level analysis should be used for result validation.

E4KP0, E3KP1, E3KP2  
cis-1,2-Dichloroethene, Trichloroethene

E4KP3  
Trichloroethene

The following volatile samples have reported concentrations that exceeded the instrument's linear calibration range. These results were flagged "E" by the laboratory and are estimated "J". No further diluted analysis was performed since this sample was used for QC purposes only.

E4KP1MS  
cis-1,2-Dichloroethene, Trichloroethene

E4KP1MSD  
Trichloroethene

The following volatile samples had alkanes improperly listed on the Form I TICs. They were removed by the Reviewer.

VBLK30

The following volatile samples have a compound identified by CAS No. in some samples and as an Unknown TIC in other samples. A comparison of the chromatograms demonstrated that the same compound was present in the respective samples. Copies of the chromatograms are included with the validation report. See Section 4 for more information.

Reviewed by: Deborah Connet / Techlaw-ESAT  
Date: 12/30/2011

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

Page 7 of 8  
SDG Number: E4KP0  
Laboratory: KAP Technologies

Unknown @ 16.01  
VBLK36

versus

CAS No. 556-67-2 Cyclotetrasiloxane, octamethy  
VHBLK01

The Trace Volatile Sample Summary Reports did not include the TICs with CAS Numbers.  
Please refer to Word document "41921 E4KP0 TIC REPORT" for the validated TIC results.

E4KP0, E4KP1, E4KP1ME, E4KP2, E4KP2ME, E4KP3, VBLK30, VBLK32, VBLK34,  
VBLK36

Reviewed by: Deborah Connet / Techlaw-ESAT  
Date: 12/30/2011

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

Page 8 of 8  
SDG Number: E4KP0  
Laboratory: KAP Technologies

CADRE Data Qualifier Sheet

<u>Qualifiers</u>	<u>Data Qualifier Definitions</u>
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification and the associated numerical value represents its approximate concentration.
R	The data are unusable. (The compound may or may not be present.)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
SUPERFUND DIVISION

DATE:

SUBJECT: Review of Data  
Received for Review on: 12 December 2011

FROM: Timothy Prendiville, Supervisor (SR-6J)  
Superfund Contract Management Section

TO: Data User: CH2M Hill  
Email Address: dshekosk@ch2m.com  
Level 3 Data Validation

We have reviewed the data for the following case:

SITE Name: Outboard Marine Corporation (IL)

Case Number: 41921                      SDG Number: E4KP4

Number and Type of Samples: 7 Soil Samples (Low/Med VOA)

Sample Numbers: E4KP4, E4KP5, E4KP6, E4KP7, E4KP8, E4KP9, E4KQ0

Laboratory: KAP Technologies                      Hrs for Review:

Following are our findings:

CC: Howard Pham  
Region 5 TPO  
Mail Code: SA-5J

Case Number: 41921  
Site Name: Outboard Marine Corporation (IL)

Page 2 of 8  
SDG Number: E4KP4  
Laboratory: KAP Technologies

**Below is a summary of the out-of-control audits and the possible effects on the data for this case:**

Seven (7) soil samples labeled E4KP4, E4KP5, E4KP6, E4KP7, E4KP8, E4KP9, and E4KQ0, were shipped to KAP Technologies located in The Woodlands, TX. All samples were collected between 11/21/11 and 11/28/11 and received between 11/22/11 and 11/29/11 intact. Samples E4KP4-E4KP8 were received by the laboratory at temperatures below the  $4 \pm 2^{\circ}\text{C}$  temperature QC Limit. Sample results are not qualified for this discrepancy.

All samples were analyzed for the Low/Med VOA list of compounds. All samples were analyzed according to CLP SOW SOM01.2 (6/2007) and reviewed according to the NFG for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.6).

No samples were designated by the samplers to be used for laboratory QC, i.e. MS/MSD analyses. The laboratory selected sample E4KP5 for the MS/MSD analyses.

No samples were identified as field blanks. Samples E4KP6 and E4KP7 were identified as field duplicates.

Case Number: 41921  
Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP4  
Laboratory: KAP Technologies

**1. HOLDING TIME**

No Problems Found.

**2. GC/MS TUNING AND GC INSTRUMENT PERFORMANCE**

No Problems Found.

**3. CALIBRATION**

The following volatile samples are associated with an initial calibration percent relative standard deviation (%RSD) outside criteria. The compounds were not detected in the samples. Non-detected compounds are not qualified unless qualified for another criteria.

E4KP4, E4KP5, E4KP5MS, E4KP5MSD, E4KP6, E4KP7, E4KP8, VBLK54, VBLK56,  
VBLK75, VHBLK01  
Bromomethane, 1,2,3-Trichlorobenzene

E4KP4ME, E4KP5ME, E4KP6ME, E4KP7ME, E4KP8ME, E4KP9, E4KP9DL,  
E4KQ0, E4KQ0DL, VBLK59, VBLK73  
1,2,3-Trichlorobenzene

The following volatile samples are associated with an opening CCV percent difference (%D) outside criteria. The compound was not detected in the samples. Non-detected compounds are qualified "UJ".

E4KP4ME, E4KP5ME, E4KP6ME, E4KP7ME, E4KP8ME, VBLK59  
1,2,3-Trichlorobenzene

E4KP7, E4KP8, VBLK56  
Bromomethane

**4. BLANKS**

The following volatile samples have common contaminant analyte concentrations reported less than 2x the CRQL. The associated method blank has common contaminant analyte concentration less than 2x the concentration criteria. Reported sample concentrations have been elevated to 2x the CRQL and qualified "U".

E4KP9, E4KP9DL, E4KQ0, E4KQ0DL  
Methylene chloride

Case Number: 41921  
Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP4  
Laboratory: KAP Technologies

The following volatile samples have common contaminant analyte concentrations reported less than 2x the CRQL. The associated storage blank has common contaminant analyte concentration less than 2x the concentration criteria. Reported sample concentrations have been elevated to 2x the CRQL and qualified "U".

E4KP5MSD  
Methylene chloride

The following volatile samples have common contaminant analyte concentrations reported greater or equal to 2x the CRQL and less than 4x the CRQL. The associated storage blank has common contaminant analyte concentration less than 2x the concentration criteria. Reported sample concentrations have been elevated to 4x the CRQL and qualified "U".

E4KP5MS  
Methylene chloride

The following volatile samples have TIC concentrations reported less than 5X the method blank concentration. Detected compounds are qualified "U" and deleted from the TIC report.

Unknown @ 11.02  
E4KP4ME, E4KP5ME, E4KP6ME, E4KP7ME, E4KP9, E4KP9DL, E4KQ0, E4KQ0DL,  
VHBLK01

CAS No. 541-05-9 Cyclotrisiloxane, hexamethyl-  
E4KP9, E4KQ0DL, VHBLK01

## **5. DEUTERATED MONITORING COMPOUND AND SURROGATE RECOVERY**

The following volatile samples have DMC/SMC recoveries above the upper limit of the criteria window. The compounds were not detected in the sample. Non-detected compounds are not qualified.

E4KP6  
Trichlorofluoromethane, 1,1,2-Trichloro-1,2,2-trifluoroethane, Methyl acetate,  
Methylene chloride, Methyl-tert-butyl ether, 1,1,1-Trichloroethane,  
Carbon tetrachloride, 1,2-Dichloroethane, 1,2-Dibromoethane

The following volatile samples have one or more DMC/SMC recovery values less than the primary lower limit but greater than or equal to the expanded lower limit of the criteria window. The compounds were not detected in the sample. Non-detected compounds are qualified "UJ".

E4KP5  
Dichlorodifluoromethane, Chloromethane, Bromomethane, Chloroethane,  
Carbon disulfide

Case Number: 41921  
Site Name: Outboard Marine Corporation (IL)

Page 5 of 8  
SDG Number: E4KP4  
Laboratory: KAP Technologies

#### 6A. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

No samples were designated by the samplers to be used for laboratory QC, i.e. MS/MSD analyses. The laboratory selected sample E4KP5 for the MS/MSD analyses.

The following volatile matrix spike/matrix spike duplicate samples have percent recoveries that are less than the expanded lower acceptance limit (20%). The compound was detected in the unspiked samples (E4KP5, E5KP5ME). Detected compounds in the unspiked samples (E4KP5, E5KP5ME) are qualified "J".

E4KP5MS, E4KP5MSD  
Trichloroethene

The following volatile matrix spike/matrix spike duplicate samples have percent recovery greater than or equal to the expanded lower acceptance limit (20%) but less than the primary lower acceptance limit. The compound was not detected in the unspiked samples (E4KP5, E5KP5ME). Non-detected compounds in the unspiked samples (E4KP5, E5KP5ME) are qualified "UJ".

E4KP5MSD  
1,1-Dichloroethene

#### 6B. LABORATORY CONTROL SAMPLE

Not applicable to Low/Med VOA analyses.

#### 7. FIELD BLANK AND FIELD DUPLICATE

No samples were identified as field blanks. Samples E4KP6 and E4KP7 were identified as field duplicates. Results are summarized in the following table:

	E4KP6	E4KP7	%RPDs
	µg/kg	µg/kg	
1,1-Dichloroethene	110	ND	200
cis-1,2-Dichloroethene	4900	1600	102
Trichloroethene	44000	24000	59
# of TICs	1	0	----

\*Because E4KP6ME and E4KP7ME were analyzed at different dilutions, the RPDs are not calculated.

Results are not qualified based upon the results of the field duplicates.

Case Number: 41921  
Site Name: Outboard Marine Corporation (IL)

Page 6 of 8  
SDG Number: E4KP4  
Laboratory: KAP Technologies

## **8. INTERNAL STANDARDS**

No Problems Found.

## **9. COMPOUND IDENTIFICATION**

After reviewing the mass spectra and chromatograms it appears that all Low/Med VOA compounds were properly identified.

## **10. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS**

During the data validation process, it has come to the attention of several reviewers that the data generated by the laboratory appears to have an error in the formula used to correct positive results in LOW LEVEL VOLATILE soils for sample size and percent moisture. The reported CRQLs and the results for TIC compounds are correct when using the formula as stated in the SOW SOM01.2. When the same formula is used to calculate the final results for detected compounds, the calculated results are one-half what is reported on the FORM Is or final result tables in EXES. This error is also duplicated with the blank results. It is the opinion of the reviewers that somewhere in the data reduction process at the laboratory an erroneous formula or data input is occurring.

The following volatile samples have analyte concentrations below the quantitation limit (CRQL). Detected compounds are qualified "J".

E4KP6ME, E4KP7ME, E4KP8ME  
cis-1,2-Dichloroethene

VBK59  
Methylene chloride

A library search indicates a match at or above 85% for a TIC compound in the volatile sample. Detected compounds are qualified "NJ".

Cas No. 541-05-9 Cyclotrisiloxane, hexamethyl-  
E4KP6, VBK73, VBK75

Cas No. 556-67-2 Cyclotetrasiloxane, octamethyl-  
E4KP9, VBK59

A library search indicates a match below 85% for a TIC compound in the volatile sample. Detected compounds are qualified "J".

Unknown @ 10.99  
VBK54, VBK56, VBK59, VBK73, VBK75

Case Number: 41921  
Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP4  
Laboratory: KAP Technologies

Unknown @ 15.96  
E4KP4, E4KP9DL

Unknown @ 16.25  
E4KP5ME, E4KP6ME, E4KP8ME, E4KQ0, VBLK75

## 11. SYSTEM PERFORMANCE

GC/MS baseline indicated acceptable performance.

## 12. ADDITIONAL INFORMATION

\*\*See Section 10. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS for information on the laboratories Low Level VOA calculations.

The following volatile samples have reported concentrations that exceeded the instrument's linear calibration range. These results were flagged "E" by the laboratory and are estimated "J". The results from the diluted or medium level samples should be used for result validation.

E4KP4, E4KP5, E4KP7, E4KP9, E4KQ0  
Trichloroethene

E4KP6, E4KP8  
cis-1,2-Dichloroethene, Trichloroethene

The following volatile samples have reported concentrations that exceeded the instrument's linear calibration range. These results were flagged "E" by the laboratory and are estimated "J". No further diluted analysis was performed since this sample was used for QC purposes only.

E4KP5MS, E4KP5MSD  
Trichloroethene

TICs with no CAS Numbers were not reported in the EXES Sample Summary Report for the volatile fraction. Please refer to Word document "41921 SDG E4KP4 TIC" for the validated TIC results.

Case Number: 41921  
Site Name: Outboard Marine Corporation (IL)

Page 8 of 8  
SDG Number: E4KP4  
Laboratory: KAP Technologies

CADRE Data Qualifier Sheet

<u>Qualifiers</u>	<u>Data Qualifier Definitions</u>
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification and the associated numerical value represents its approximate concentration.
R	The data are unusable. (The compound may or may not be present.)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
SUPERFUND DIVISION

DATE:

SUBJECT: Review of Data  
Received for Review on: 28 December 2011

FROM: Timothy Prendiville, Supervisor (SR-6J)  
Superfund Contract Management Section

TO: Data User: CH2M Hill  
Email Address: dshekos@ch2m.com; shannon.olson@CH2M.com

Level 3 Data Validation

We have reviewed the data for the following case:

SITE Name: Outboard Marine Corp-OMC (IL)

Case Number: 41921 SDG Number: E4KQ1

Number and Type of Samples: 11 Soil Samples (Low/Med VOA)

Sample Numbers: E4KQ1-E4KQ9, E4KR0, E4KR2

Laboratory: KAP Technologies Hrs for Review:

Following are our findings:

CC: Howard Pham  
Region 5 TPO  
Mail Code: SA-5J

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

Page 2 of 8  
SDG Number: E4KQ1  
Laboratory: KAP Technologies

**Below is a summary of the out-of-control audits and the possible effects on the data for this case:**

Eleven (11) soil samples labeled E4KQ1-E4KQ9, E4KR0, and E4KR2, were shipped to KAP Technologies located in The Woodlands, TX. All samples were collected between 12/01 and 12/07/2011 and received between 12/02 and 12/08/2011 intact. Samples E4KR0 and E4KR2 were received by the laboratory at temperatures below the  $4 \pm 2^{\circ}\text{C}$  temperature QC Limit. Sample results are not qualified for this discrepancy.

All samples were analyzed for the Low/Med VOA list of compounds. All samples were analyzed according to CLP SOW SOM01.2 (6/2007) and reviewed according to the NFG for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.6).

No samples were designated by the samplers to be used for laboratory QC, i.e. MS/MSD analyses. The laboratory selected sample E4KQ3 for the MS/MSD analyses.

No samples were identified as field blanks. Samples E4KQ4 and E4KQ5 were identified as field duplicates.

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

Page 3 of 8  
SDG Number: E4KQ1  
Laboratory: KAP Technologies

**1. HOLDING TIME**

No Problems Found.

**2. GC/MS TUNING AND GC INSTRUMENT PERFORMANCE**

No Problems Found.

**3. CALIBRATION**

The following volatile samples are associated with an initial calibration percent relative standard deviation (%RSD) outside criteria. Detected compounds are qualified "J". Non-detected compounds are not qualified.

E4KQ1, E4KQ1DL, E4KQ2, E4KQ2DL, E4KQ3, E4KQ3DL, E4KQ3MS, E4KQ3MSD,  
E4KQ4, E4KQ4DL, E4KQ5, E4KQ5DL, E4KQ6, E4KQ6DL, E4KQ7, E4KQ7DL,  
E4KQ8, E4KQ8DL, E4KQ9, E4KQ9DL, E4KR0, E4KR0DL, E4KR2, E4KR2DL,  
VBLK77, VBLK79, VBLK82, VBLK84, VBLK87  
1,2,3-Trichlorobenzene

VBLK94, VHBLK01  
Bromomethane

The following volatile samples are associated with an opening CCV percent difference (%D) outside criteria. The compounds were not detected in the samples. Non-detected compounds are qualified "U".

E4KQ3MS, E4KQ3MSD, VBLK82  
Bromomethane, 1,1,2,2-Tetrachloroethane

E4KQ3, E4KQ3DL, E4KQ4, E4KQ4DL, E4KQ5, E4KQ5DL, E4KQ6, E4KQ6DL,  
E4KQ7, E4KQ7DL, E4KQ8, E4KQ8DL, E4KQ9, E4KQ9DL, VBLK79, VBLK84  
Bromomethane

**4. BLANKS**

The following volatile samples have common contaminant analyte concentrations reported less than 2x the CRQL. The associated method blank has common contaminant analyte concentration less than 2x the concentration criteria. Reported sample concentrations have been elevated to 2x the CRQL and qualified "U".

E4KQ3, E4KQ3DL, E4KQ3MS, E4KQ3MSD, E4KQ4, E4KQ4DL, E4KQ5, E4KQ5DL,  
E4KR0, E4KR0DL, E4KR2, E4KR2DL, VHBLK01  
Methylene chloride

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

SDG Number: E4KQ1  
Laboratory: KAP Technologies

The following volatile samples have TIC concentrations reported less than 5X the method blank concentration. Detected compounds are qualified "U" and deleted from the TIC report.

Unknown @ 10.98

E4KQ1, E4KQ1DL, E4KQ2, E4KQ2DL, E4KQ3DL, E4KQ4DL, E4KQ5DL,  
E4KQ6DL, E4KQ7DL, E4KQ8, E4KQ8DL, E4KQ9, E4KQ9DL, E4KR0DL,  
E4KR2DL, VHBLK01

Cas No. 541-05-9 Cyclotrisiloxane, hexamethyl-

E4KQ3, E4KQ3DL, E4KQ4, E4KQ4DL, E4KQ5, E4KQ5DL, E4KQ6DL, E4KQ7,  
E4KQ7DL, E4KQ8, E4KQ9, E4KQ9DL

Cas No. 556-67-2 Cyclotetrasiloxane, octamethyl-

E4KQ6, E4KQ6DL, E4KQ7, E4KQ8, E4KQ8DL, E4KQ9, E4KQ9DL

#### **5. DEUTERATED MONITORING COMPOUND AND SURROGATE RECOVERY**

The following volatile samples have DMC/SMC recoveries above the upper limit of the criteria window. The compounds were not detected in the sample. Non-detected compounds are not qualified.

E4KR2DL

Dichlorodifluoromethane, Chloromethane, Bromomethane, Chloroethane, Carbon disulfide

The following volatile samples have one or more DMC/SMC recovery values less than the primary lower limit but greater than or equal to the expanded lower limit of the criteria window. The compounds were not detected in the sample. Non-detected compounds are qualified "UJ".

E4KQ6

Dichlorodifluoromethane, Chloromethane, Bromomethane, Chloroethane, Carbon disulfide

#### **6A. MATRIX SPIKE/MATRIX SPIKE DUPLICATE**

No samples were designated by the samplers to be used for laboratory QC, i.e. MS/MSD analyses. The laboratory selected sample E4KQ3 for the MS/MSD analyses.

The following volatile matrix spike/matrix spike duplicate samples have percent recoveries that are less than the expanded lower acceptance limit. Detected compounds in the unspiked samples (E4KQ3, E4KQ3DL) are qualified "J".

E4KQ3MS, E4KQ3MSD  
Trichloroethene

Case Number: 41921  
 Site Name: Outboard Marine Corp-OMC (IL)

SDG Number: E4KQ1  
 Laboratory: KAP Technologies

The relative percent difference (RPD) between the following volatile matrix spike and matrix spike duplicate recoveries is outside criteria. Detected compounds in the unspiked sample (E4KQ3, E4KQ3DL) are qualified "J".

E4KQ3MS, E4KQ3MSD  
 Trichloroethene

## 6B. LABORATORY CONTROL SAMPLE

Not applicable to VOA analyses.

## 7. FIELD BLANK AND FIELD DUPLICATE

No samples were identified as field blanks.

Sample E4KQ4 was identified as a field duplicate of sample E4KQ5. Results are summarized in the following table:

	E4KQ4	E5KQ5	%RPDs	E4KQ4DL	E5KQ5DL	%RPDs
	µg/kg	µg/kg		µg/kg	µg/kg	
cis-1,2-Dichloroethene	1900	1800	5	ND	ND	---
Trichloroethene	120000	110000	9	100000	110000	10
# of VOA TICs	1	1	---	ND	1	---

Results are not qualified based upon the results of the field duplicates.

## 8. INTERNAL STANDARDS

No Problems Found.

## 9. COMPOUND IDENTIFICATION

After reviewing the mass spectra and chromatograms it appears that all Low/Med VOA compounds were properly identified.

## 10. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS

During the data validation process, it has come to the attention of several reviewers that the data generated by the laboratory appears to have an error in the formula used to correct positive results in the LOW LEVEL VOLATILE soils for sample size and percent moisture. The reported CRQLs and the results for TIC compounds are correct when using the formula as stated in the SOW SOM01.2. When the same formula is used to calculate the final results for detected compounds, the calculated results are one-half what is reported on the FORM Is or final result tables in EXES. This error is also duplicated with the blank results. It is the opinion of the

Case Number: 41921  
Site Name: Outboard Marine Corp-OMC (IL)

Page 6 of 8  
SDG Number: E4KQ1  
Laboratory: KAP Technologies

reviewers that somewhere in the data reduction process at the laboratory an erroneous formula or data input is occurring.

The following volatile samples have analyte concentrations below the quantitation limit (CRQL). Detected compounds are qualified "J".

E4KQ6DL, E4KQ7, E4KQ7DL, E4KQ8, E4KQ9DL, VBLK77, VBLK82, VBLK87  
Methylene chloride

VBLK84  
1,2,3-Trichlorobenzene

A library search indicates a match at or above 85% for a TIC compound in the volatile sample. Detected compounds are qualified "NJ".

Cas No. 541-05-9 Cyclotrisiloxane, hexamethyl-  
E4KQ1, E4KQ1DL, E4KQ2, E4KQ2DL, E4KR0, E4KR0DL, E4KR2, E4KR2DL,  
VBLK79, VBLK82, VBLK84

Cas No. 556-67-2 Cyclotetrasiloxane, octamethyl-  
E4KQ2, E4KQ2DL, E4KQ3, E4KQ4, E4KR0, E4KR0DL, E4KR2, VBLK82, VBLK84

A library search indicates a match below 85% for a TIC compound in the volatile sample. Detected compounds are qualified "J".

Unknown @ 10.98  
VBLK77, VBLK79, VBLK82, VBLK84, VBLK87, VBLK94

Unknown @ 11.86  
E4KQ6, E4KQ8DL

Unknown @ 15.99  
E4KQ5

Unknown @ 16.24  
E4KQ3DL, E4KQ5DL

Unknown @ 19.43  
E4KR2

## 11. SYSTEM PERFORMANCE

GC/MS baseline indicated acceptable performance.

Case Number: 41921

SDG Number: E4KQ1

Site Name: Outboard Marine Corp-OMC (IL)

Laboratory: KAP Technologies

## 12. ADDITIONAL INFORMATION

\*\* See note in Section 10. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS regarding the sample results.

The following volatile samples have reported concentrations that exceeded the instrument's linear calibration range. These results were flagged "E" by the laboratory and are estimated "J". The results from the diluted samples should be used for result validation.

E4KQ1, E4KQ2, E4KQ3, E4KQ4, E4KQ5, E4KQ6, E4KQ7, E4KQ8, E4KQ9, E4KR0,  
E4KR2

Trichloroethene

The following volatile QC samples have reported concentrations that exceeded the instrument's linear calibration range. These results were flagged "E" by the laboratory and are estimated "J". No dilutions were required as they are QC samples.

E4KQ3MS, E4KQ3MSD

Trichloroethene

TICs with no CAS Numbers were not reported in the EXES Sample Summary Report for the volatile and semivolatile fractions. Please refer to Word document "41921 SDG E4KQ1 TIC" for the validated TIC results.

CADRE Data Qualifier Sheet

<u>Qualifiers</u>	<u>Data Qualifier Definitions</u>
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification and the associated numerical value represents its approximate concentration.
R	The data are unusable. (The compound may or may not be present.)

February 2012

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# Data Usability Evaluation—February 2012

## OMC Plant 2 Site, Waukegan, Illinois

### WA No. 151-RARA-0528, Contract No. EP-S5-06-01

PREPARED FOR: U.S. Environmental Protection Agency  
PREPARED BY: Adrienne Korpela/CH2M HILL  
DATE: March 19, 2012

This memorandum presents the results of the data usability evaluation of soil and groundwater data from the Outboard Marine Corporation (OMC) Plant 2 site in Waukegan, Illinois. The samples were collected in February 2012 and analyzed by either a subcontract laboratory or a laboratory in the U.S. Environmental Protection Agency's (USEPA's) Contract Laboratory Program (CLP). The analytical results will be used to evaluate the effectiveness of the in situ soil mixing component of the TCE DNAPL remedy.

## Analytical Data

A total of 22 soil samples and 4 groundwater samples, including quality control (QC) samples were collected and shipped by overnight carrier to the laboratories for analysis. The analytical parameter class, methodology, and laboratory performing the analysis are shown in Table 1.

TABLE 1  
Analytical Parameters  
*OMC Plant 2*

Parameter Class	Method	Laboratory
<b>Soil Samples</b>		
Volatile organic compounds	CLP SOW SOM01.2	KAP Technologies, Inc. The Woodlands, Texas
<b>Groundwater Samples</b>		
Volatile organic compounds	CLP SOW SOM01.2	KAP Technologies, Inc. The Woodlands, Texas
Dissolved gases (methane, ethane, ethene)	RSK 175	CT Laboratories, LLC Baraboo, Wisconsin
Chloride	USEPA 300.0	CT Laboratories, LLC Baraboo, Wisconsin

As part of the quality assurance process outlined in the site-specific quality assurance project plan (CH2M HILL 2011), QC samples were collected in the field to complement the assessment of overall data quality and usability. The QC samples consisted of field duplicates, aliquots for laboratory matrix spike/matrix spike duplicates, and a volatile organic compound (VOC) trip blank. Table 2 presents the station locations, sample delivery group (SDG), and sample identifications (IDs).

TABLE 2  
Sample Summary by Sample ID and Location  
OMC Plant 2

Station Location	SDG	Sample ID	Station Location	SDG	Sample ID
<b>Soil Samples</b>					
OMC-SO-001-B	E5CS0	E5CS0	OMC-SO-006-B	E5CS9	E5CT1
OMC-SO-001-M	E5CS0	E5CS1	OMC-SO-006-M	E5CS9	E5CT2
OMC-SO-002-B	E5CS0	E5CS2	OMC-SO-007-B	E5CS9	E5CT3
OMC-SO-002-M	E5CS0	E5CS3	OMC-SO-007-M	E5CS9	E5CT4
OMC-SO-003-B	E5CS0	E5CS4	OMC-SO-007-M (FD)	E5CS9	E5CT5
OMC-SO-003-M	E5CS0	E5CS5	OMC-SO-008-B	E5CS9	E5CT6
OMC-SO-004-B	E5CS0	E5CS6	OMC-SO-008-M	E5CS9	E5CT7
OMC-SO-004-B (FD)	E5CS0	E5CS7	OMC-SO-009-B	E5CS9	E5CT8
OMC-SO-004-M	E5CS0	E5CS8	OMC-SO-009-M	E5CS9	E5CT9
OMC-SO-005-B	E5CS9	E5CS9	OMC-SO-010-B	E5CS9	E5CW0
OMC-SO-005-M	E5CS9	E5CT0	OMC-SO-010-M	E5CS9	E5CW1
<b>Water Samples</b>					
OMC-TW-001	E5CS0 89267	E5CW3 12CW01-01	OMC-TW-002 (FD)	E5CS0 89267	E5CW5 12CW01-03
OMC-TW-002	E5CS0 89267	E5CW4 12CW01-02	OMC-TB-001 (TB)	E5CS0	E5CW2

FD = field duplicate

TB = trip blank

## Subcontract Laboratory Data

The dissolved gases and chloride data were analyzed by a CT Laboratories and reviewed by CH2M HILL. The data were reviewed to assess their analytical accuracy, precision, and completeness. The review was conducted in accordance with the site-specific quality assurance project plan (CH2M HILL, 2011). A forms review was conducted on 100 percent of the definitive data. The forms review consisted of a review of the following quality control (QC) items:

- Holding times and sample receipt conditions
- Required QC samples at the specified frequencies
- Matrix spike (MS)/matrix spike duplicate (MSD) precision and accuracy
- Laboratory control sample (LCS) precision and accuracy
- Blank contamination and, if any, its impact on the analytical results
- Initial calibration and continuing calibration precision and accuracy
- Laboratory and field duplicate precision

The quality assurance (QA)/QC limits implemented during the data quality evaluation were those listed in the site-specific QAPP. Standard data qualifiers were added as a means of classifying the data as to their conformance to QA/QC requirements. The data qualifiers are defined as follows:

- [U] Undetected. The analyte was analyzed for but not detected at a concentration equal to or greater than the laboratory reporting limit.

- [J] Estimated. The analyte was below the stated reporting limit, but greater than the method detection limit, or there is an analytical bias.

The analytical results were within project control limits, except where noted below.

## Matrix Spikes/Matrix Spike Duplicates

MS/MSD samples were analyzed as required, and generally, all accuracy and precision criteria were met.

Chloride exhibited MS and MSD recoveries lower than control limits. Chloride was detected in the parent sample and the results were qualified and flagged "J" due to a potential low bias.

## Field Duplicates

One field duplicate (FD) was collected and analyzed as required and precision criteria were met with the following exceptions:

The relative percent difference for dissolved gas compounds methane, ethane, and ethene exceeded the QC limit of 30 percent. The detected sample results were qualified as estimated and flagged "J" in the field duplicate pair.

## Conclusions

The evaluation of the MS/MSD and FD data indicates possible bias due to applicable QC statistics. However, the accuracy and precision were generally acceptable, and the data set completeness was deemed as 100 percent usable and may be used in the project decision making process with qualification.

## Contract Laboratory Program Data

The VOC samples, analyzed by a laboratory in the USEPA CLP, completed the data assessment process by the Sample Management Office (SMO). The data set was then reviewed by USEPA's Environmental Service Assistance Team contractor, TechLaw, to assess the accuracy and precision of the method and the matrix using the appropriate criteria established in the National Functional Guidelines and to verify that the data set was complete. USEPA validators added data qualifiers when the QC statistics indicated a possible bias to specific compounds or analytes associated with a particular method and sample batch. Attachment 1 contains the case narratives prepared by Techlaw ESAT during data reviews.

Standard data qualifiers are a means to classify these data with regard to their conformance to QC requirements. The applied data qualifiers are defined as follows:

- [U] The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- [J] The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- [J+] The result is an estimated quantity, but the result may be biased high.
- [J-] The result is an estimated quantity, but the result may be biased low.
- [UJ] The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- [R] The data are unusable. The sample results are rejected due to serious deficiencies in meeting Quality Control (QC) criteria. The analyte may or may not be present in the sample.

CH2M HILL reviewed the validation performed by USEPA for the samples in Case Number 42215, sample delivery groups E5CS0 and E5CS9. The USEPA validation case narratives and worksheets indicate that some sample results should be qualified as biased based on the applicable QC limits or other National Functional Guidelines requirements. The narratives and worksheets are presented in Attachment 1.

The following sections summarize the data validation findings and usability of the final reportable results. The sample numbers and locations summarized below do not include the quality assurance/QC samples.

## Volatile Organic Compound Data

The VOC data set consists of the results for 52 analytes from groundwater samples collected from 2 temporary well locations and 20 soil samples collected at 10 locations, resulting in 1144 results.

The data validation summary indicates the following:

- U, UJ, and J qualifiers were applied to sample results that were potentially affected by QC deficiencies.
- J qualifiers were applied to sample results that were reported between the method detection limit and the reporting limit.
- Eight of the reported VOC results were rejected. The deuterated monitoring compound and surrogate recoveries were below the expanded lower limit criteria for sample E5CS4. The nondetected sample result for 1,4-dioxane was qualified "R" as unusable. The internal standard area counts were below the lower limit criteria for sample E5CW1. The nondetected sample results for bromoform; 1,2,3-trichlorobenzene; 1,2,4-trichlorobenzene; 1,2-dibromo-3-chloropropane; 1,2-dichlorobenzene; 1,3-dichlorobenzene; 1,4-dichlorobenzene were qualified "R" as unuseable.

99.3 percent of the VOC data, as qualified, can be used to make project decisions.

## Overall Assessment

The final activity in the data quality evaluation is an assessment of whether the data meet the data quality objectives. The goal of the assessment was to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision making process. The following summary highlights the data evaluation findings for the above-defined events:

1. The completeness objective of 90 percent was met for all method/analyte combinations.
2. The precision and accuracy of the data, as measured by field and laboratory QC indicators, indicate that the data quality objectives were met.

The data summary tables are included at the end of this document.

## Reference Cited

CH2M HILL. 2011. *Quality Assurance Project Plan, OMC Plant 2 Site, Waukegan, Illinois*. WA No. 074-RARA-0528 Contract No. EP-S5-06-01. February.

USEPA. 2008. *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*. June.

Tables

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# Two-Month In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

February 7 and 8, 2012

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 001-B B-47 18 - 19 2/7/2012	OMC-SO- 001-M B-47 10 - 11 2/7/2012	OMC-SO- 002-B G-42 18 - 19 2/7/2012	OMC-SO- 002-M G-42 10 - 11 2/7/2012	OMC-SO- 003-B C-38 18 - 19 2/7/2012	OMC-SO- 003-M C-38 9 - 10 2/7/2012
<b>Volatile Organic Compounds</b>							
1,1,1-TRICHLOROETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,1,2,2-TETRACHLOROETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,1,2-TRICHLOROETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,1-DICHLOROETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,1-DICHLOROETHYLENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,2,3-TRICHLOROBENZENE	UG/KG	5.2 U	6.1 U	3 J	5.7 U	5.2 U	5.2 U
1,2,4-TRICHLOROBENZENE	UG/KG	5.2 U	6.1 U	2.6 J	5.7 U	5.2 U	5.2 U
1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,2-DICHLOROBENZENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,2-DICHLOROETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,2-DICHLOROPROPANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,4-DICHLOROBENZENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
1,4-DIOXANE (P-DIOXANE)	UG/KG	100 U	120 U	100 U	110 U	100 R	100 U
ACETONE	UG/KG	45	12 U	28	11 U	25	47
BENZENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
BROMODICHLOROMETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
BROMOMETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CARBON DISULFIDE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CARBON TETRACHLORIDE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CFC-11	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CFC-12	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CHLORINATED FLUOROCARBON (FREON 113)	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CHLOROBENZENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CHLOROBROMOMETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U

# Two-Month In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

February 7 and 8, 2012

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 001-B B-47 18 - 19 2/7/2012	OMC-SO- 001-M B-47 10 - 11 2/7/2012	OMC-SO- 002-B G-42 18 - 19 2/7/2012	OMC-SO- 002-M G-42 10 - 11 2/7/2012	OMC-SO- 003-B C-38 18 - 19 2/7/2012	OMC-SO- 003-M C-38 9 - 10 2/7/2012
CHLORODIBROMOMETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CHLOROETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CHLOROFORM	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CHLOROMETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CIS-1,2-DICHLOROETHYLENE	UG/KG	8.2	2.4 J	150	20	7.3	6.7
CIS-1,3-DICHLOROPROPENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
CYCLOHEXANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
DICHLOROMETHANE	UG/KG	2.1 J	6.1 U	5.2 U	2.6 J	5.2 U	2.4 J
ETHYLBENZENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
ISOPROPYLBENZENE (CUMENE)	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
M,P-XYLENE (SUM OF ISOMERS)	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
M-DICHLOROBENZENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
METHYL ACETATE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
METHYL ETHYL KETONE (2-BUTANONE)	UG/KG	10 U	12 U	10 U	11 U	10 U	10 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/KG	10 U	12 U	10 U	11 U	10 U	10 U
METHYL N-BUTYL KETONE	UG/KG	10 U	12 U	10 U	11 U	10 U	10 U
METHYLBENZENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
METHYLCYCLOHEXANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
O-XYLENE (1,2-DIMETHYLBENZENE)	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
STYRENE (MONOMER)	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
TERT-BUTYL METHYL ETHER	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
TETRACHLOROETHYLENE(PCE)	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
TRANS-1,2-DICHLOROETHENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
TRANS-1,3-DICHLOROPROPENE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
TRIBROMOMETHANE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U
TRICHLOROETHYLENE	UG/KG	5.2 U	6.1 U	89	5.7 U	2.8 J	4 J
VINYL CHLORIDE	UG/KG	5.2 U	6.1 U	5.2 U	5.7 U	5.2 U	5.2 U

# Two-Month In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

February 7 and 8, 2012

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 004-B J-31 18 - 19 2/7/2012	OMC-SO- 004-B, dup J-31 18 - 19 2/7/2012	OMC-SO- 004-M J-31 10 - 11 2/7/2012	OMC-SO- 005-B N-27 19 - 20 2/8/2012	OMC-SO- 005-M N-27 10 - 11 2/8/2012	OMC-SO- 006-B D-29 20 - 21 2/8/2012
<b>Volatile Organic Compounds</b>							
1,1,1-TRICHLOROETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,1,2,2-TETRACHLOROETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,1,2-TRICHLOROETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,1-DICHLOROETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,1-DICHLOROETHYLENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,2,3-TRICHLOROBENZENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 UJ	6.6 UJ	5.5 UJ
1,2,4-TRICHLOROBENZENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,2-DICHLOROBENZENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,2-DICHLOROETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,2-DICHLOROPROPANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,4-DICHLOROBENZENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
1,4-DIOXANE (P-DIOXANE)	UG/KG	110 U	100 U	110 U	120 U	130 U	110 U
ACETONE	UG/KG	80	67	48	42	13 U	11 U
BENZENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
BROMODICHLOROMETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
BROMOMETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CARBON DISULFIDE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CARBON TETRACHLORIDE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CFC-11	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CFC-12	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CHLORINATED FLUOROCARBON (FREON 113)	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CHLOROBENZENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CHLOROBROMOMETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U

# Two-Month In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

February 7 and 8, 2012

Waukegan, Illinois

	Station ID	OMC-SO-004-B	OMC-SO-004-B, dup	OMC-SO-004-M	OMC-SO-005-B	OMC-SO-005-M	OMC-SO-006-B
	Column ID	J-31	J-31	J-31	N-27	N-27	D-29
	Depth	18 - 19	18 - 19	10 - 11	19 - 20	10 - 11	20 - 21
	Sample Date	2/7/2012	2/7/2012	2/7/2012	2/8/2012	2/8/2012	2/8/2012
CHLORODIBROMOMETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CHLOROETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CHLOROFORM	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CHLOROMETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CIS-1,2-DICHLOROETHYLENE	UG/KG	5.6 U	5.1 U	4.1 J	110	19	19
CIS-1,3-DICHLOROPROPENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
CYCLOHEXANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
DICHLOROMETHANE	UG/KG	5.6 U	2.1 J	5.5 U	12 U	13 U	11 U
ETHYLBENZENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
ISOPROPYLBENZENE (CUMENE)	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
M,P-XYLENE (SUM OF ISOMERS)	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
M-DICHLOROBENZENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
METHYL ACETATE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
METHYL ETHYL KETONE (2-BUTANONE)	UG/KG	11 U	10 U	11 U	12 U	13 U	11 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/KG	11 U	10 U	11 U	12 U	13 U	11 U
METHYL N-BUTYL KETONE	UG/KG	11 U	10 U	11 U	12 U	13 U	11 U
METHYLBENZENE	UG/KG	4.2 J	3.7 J	2.8 J	6.1 U	6.6 U	5.5 U
METHYLCYCLOHEXANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
O-XYLENE (1,2-DIMETHYLBENZENE)	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
STYRENE (MONOMER)	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
TERT-BUTYL METHYL ETHER	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
TETRACHLOROETHYLENE(PCE)	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
TRANS-1,2-DICHLOROETHENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
TRANS-1,3-DICHLOROPROPENE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
TRIBROMOMETHANE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U
TRICHLOROETHYLENE	UG/KG	42	65	11	340	3.2 J	89
VINYL CHLORIDE	UG/KG	5.6 U	5.1 U	5.5 U	6.1 U	6.6 U	5.5 U

# Two-Month In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

February 7 and 8, 2012

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 006-M D-29 10 - 11 2/8/2012	OMC-SO- 007-B I-20 20 - 21 2/8/2012	OMC-SO- 007-M I-20 10 - 11 2/8/2012	OMC-SO- 007-M, dup I-20 10 - 11 2/8/2012	OMC-SO- 008-B G-14 20 - 21 2/8/2012	OMC-SO- 008-M G-14 10 - 11 2/8/2012
<b>Volatile Organic Compounds</b>							
1,1,1-TRICHLOROETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,1,2,2-TETRACHLOROETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,1,2-TRICHLOROETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,1-DICHLOROETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,1-DICHLOROETHYLENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,2,3-TRICHLOROBENZENE	UG/KG	6.1 UJ	5.5 UJ	5 UJ	5 UJ	5.3 UJ	5.2 UJ
1,2,4-TRICHLOROBENZENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,2-DICHLOROBENZENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,2-DICHLOROETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,2-DICHLOROPROPANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,4-DICHLOROBENZENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
1,4-DIOXANE (P-DIOXANE)	UG/KG	120 U	110 U	100 U	100 U	110 U	100 U
ACETONE	UG/KG	12 U	11 U	10 U	33	53	53
BENZENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
BROMODICHLOROMETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
BROMOMETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CARBON DISULFIDE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CARBON TETRACHLORIDE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CFC-11	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CFC-12	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CHLORINATED FLUOROCARBON (FREON 113)	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CHLOROBENZENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CHLOROBROMOMETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U

# Two-Month In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

February 7 and 8, 2012

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 006-M D-29 10 - 11 2/8/2012	OMC-SO- 007-B I-20 20 - 21 2/8/2012	OMC-SO- 007-M I-20 10 - 11 2/8/2012	OMC-SO- 007-M, dup I-20 10 - 11 2/8/2012	OMC-SO- 008-B G-14 20 - 21 2/8/2012	OMC-SO- 008-M G-14 10 - 11 2/8/2012
CHLORODIBROMOMETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CHLOROETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CHLOROFORM	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CHLOROMETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CIS-1,2-DICHLOROETHYLENE	UG/KG	26	6	16	8.4	8.3	2.7 J
CIS-1,3-DICHLOROPROPENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
CYCLOHEXANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
DICHLOROMETHANE	UG/KG	12 U	11 U	10 U	10 U	11 U	10 U
ETHYLBENZENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
ISOPROPYLBENZENE (CUMENE)	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
M,P-XYLENE (SUM OF ISOMERS)	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
M-DICHLOROBENZENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
METHYL ACETATE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
METHYL ETHYL KETONE (2-BUTANONE)	UG/KG	12 U	11 U	10 U	10 U	11 U	10 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/KG	12 U	11 U	10 U	10 U	11 U	10 U
METHYL N-BUTYL KETONE	UG/KG	12 U	11 U	10 U	10 U	11 U	10 U
METHYLBENZENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
METHYLCYCLOHEXANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
O-XYLENE (1,2-DIMETHYLBENZENE)	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
STYRENE (MONOMER)	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
TERT-BUTYL METHYL ETHER	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
TETRACHLOROETHYLENE(PCE)	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
TRANS-1,2-DICHLOROETHENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
TRANS-1,3-DICHLOROPROPENE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
TRIBROMOMETHANE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U
TRICHLOROETHYLENE	UG/KG	200	380	91	52	820	510
VINYL CHLORIDE	UG/KG	6.1 U	5.5 U	5 U	5 U	5.3 U	5.2 U

# Two-Month In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

February 7 and 8, 2012

Waukegan, Illinois

Station ID Column ID Depth Sample Date	OMC-SO- 009-B K-8 20 - 21 2/8/2012	OMC-SO- 009-M K-8 10 - 11 2/8/2012	OMC-SO- 010-B F-5 20 - 21 2/8/2012	OMC-SO- 010-M F-5 11 - 12 2/8/2012
<b>Volatile Organic Compounds</b>				
1,1,1-TRICHLOROETHANE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
1,1,2,2-TETRACHLOROETHANE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
1,1,2-TRICHLOROETHANE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
1,1-DICHLOROETHANE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
1,1-DICHLOROETHYLENE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
1,2,3-TRICHLOROBENZENE UG/KG	5.2 UJ	6.3 UJ	5.4 U	5.5 R
1,2,4-TRICHLOROBENZENE UG/KG	5.2 U	6.3 U	5.4 U	5.5 R
1,2-DIBROMO-3-CHLOROPROPANE (DBCP) UG/KG	5.2 U	6.3 U	5.4 U	5.5 R
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE) UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
1,2-DICHLOROBENZENE UG/KG	5.2 U	6.3 U	5.4 U	5.5 R
1,2-DICHLOROETHANE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
1,2-DICHLOROPROPANE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
1,4-DICHLOROBENZENE UG/KG	5.2 U	6.3 U	5.4 U	5.5 R
1,4-DIOXANE (P-DIOXANE) UG/KG	100 U	130 U	110 U	110 U
ACETONE UG/KG	10 U	13 U	45	89
BENZENE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
BROMODICHLOROMETHANE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
BROMOMETHANE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CARBON DISULFIDE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CARBON TETRACHLORIDE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CFC-11 UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CFC-12 UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CHLORINATED FLUOROCARBON (FREON 113) UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CHLOROBENZENE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CHLOROBROMOMETHANE UG/KG	5.2 U	6.3 U	5.4 U	5.5 U

# Two-Month In Situ Soil Mixing Sampling Results

OMC Plant 2 ISSM

February 7 and 8, 2012

Waukegan, Illinois

	Station ID Column ID Depth Sample Date	OMC-SO- 009-B K-8 20 - 21 2/8/2012	OMC-SO- 009-M K-8 10 - 11 2/8/2012	OMC-SO- 010-B F-5 20 - 21 2/8/2012	OMC-SO- 010-M F-5 11 - 12 2/8/2012
CHLORODIBROMOMETHANE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CHLOROETHANE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CHLOROFORM	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CHLOROMETHANE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CIS-1,2-DICHLOROETHYLENE	UG/KG	15	6.3 U	3.5 J	5 J
CIS-1,3-DICHLOROPROPENE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
CYCLOHEXANE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
DICHLOROMETHANE	UG/KG	10 U	6.3 U	5.4 U	11 U
ETHYLBENZENE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
ISOPROPYLBENZENE (CUMENE)	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
M,P-XYLENE (SUM OF ISOMERS)	UG/KG	5.2 U	6.3 U	2.4 J	5.5 U
M-DICHLOROBENZENE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 R
METHYL ACETATE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
METHYL ETHYL KETONE (2-BUTANONE)	UG/KG	10 U	13 U	11 U	11 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/KG	10 U	13 U	11 U	11 U
METHYL N-BUTYL KETONE	UG/KG	10 U	13 U	11 U	11 U
METHYLBENZENE	UG/KG	5.2 U	6.3 U	5.4 U	7.2 J
METHYLCYCLOHEXANE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
O-XYLENE (1,2-DIMETHYLBENZENE)	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
STYRENE (MONOMER)	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
TERT-BUTYL METHYL ETHER	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
TETRACHLOROETHYLENE(PCE)	UG/KG	5.2 U	4.2 J	4.2 J	5.5 U
TRANS-1,2-DICHLOROETHENE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
TRANS-1,3-DICHLOROPROPENE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U
TRIBROMOMETHANE	UG/KG	5.2 U	6.3 U	5.4 UJ	5.5 R
TRICHLOROETHYLENE	UG/KG	930	810	780	500
VINYL CHLORIDE	UG/KG	5.2 U	6.3 U	5.4 U	5.5 U

# Groundwater Sampling Results

OMC Plant 2 ISSM

February 7 and 8, 2012

Waukegan, Illinois

	Station ID Column ID Sample Date	TW-001 K-08 2/7/2012	TW-002 D-29 2/8/2012	TW-002, dup D-29 2/8/2012
<b>Volatile Organic Compounds</b>				
1,1,1-TRICHLOROETHANE	UG/L	2,500 U	250 U	250 U
1,1,2,2-TETRACHLOROETHANE	UG/L	2,500 U	250 U	250 U
1,1,2-TRICHLOROETHANE	UG/L	2,500 U	250 U	250 U
1,1-DICHLOROETHANE	UG/L	2,500 U	250 U	250 U
1,1-DICHLOROETHYLENE	UG/L	2,500 U	250 U	250 U
1,2,3-TRICHLOROBENZENE	UG/L	2,500 U	250 U	250 U
1,2,4-TRICHLOROBENZENE	UG/L	2,500 U	250 U	250 U
1,2-DIBROMO-3-CHLOROPROPANE (DBCP)	UG/L	2,500 U	250 U	250 U
1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	UG/L	2,500 U	250 U	250 U
1,2-DICHLOROBENZENE	UG/L	2,500 U	250 U	250 U
1,2-DICHLOROETHANE	UG/L	2,500 U	250 U	250 U
1,2-DICHLOROPROPANE	UG/L	2,500 U	250 U	250 U
1,4-DICHLOROBENZENE	UG/L	2,500 U	250 U	250 U
1,4-DIOXANE (P-DIOXANE)	UG/L	50,000 U	5,000 U	5,000 U
ACETONE	UG/L	5,000 U	500 U	500 U
BENZENE	UG/L	2,500 U	250 U	250 U
BROMODICHLOROMETHANE	UG/L	2,500 U	250 U	250 U
BROMOMETHANE	UG/L	2,500 U	250 U	250 U
CARBON DISULFIDE	UG/L	2,500 U	250 U	250 U
CARBON TETRACHLORIDE	UG/L	2,500 U	250 U	250 U
CFC-11	UG/L	2,500 U	250 U	250 U
CFC-12	UG/L	2,500 U	250 U	250 U
CHLORINATED FLUOROCARBON (FREON 113)	UG/L	2,500 U	250 U	250 U
CHLOROBENZENE	UG/L	2,500 U	250 U	250 U
CHLOROBROMOMETHANE	UG/L	2,500 U	250 U	250 U
CHLORODIBROMOMETHANE	UG/L	2,500 U	250 U	250 U
CHLOROETHANE	UG/L	2,500 U	250 U	250 U
CHLOROFORM	UG/L	2,500 U	250 U	250 U
CHLOROMETHANE	UG/L	2,500 U	250 U	250 U

# Groundwater Sampling Results

OMC Plant 2 ISSM

February 7 and 8, 2012

Waukegan, Illinois

	Station ID Column ID Sample Date	TW-001 K-08 2/7/2012	TW-002 D-29 2/8/2012	TW-002, dup D-29 2/8/2012
CIS-1,2-DICHLOROETHYLENE	UG/L	28,000	48,000	47,000
CIS-1,3-DICHLOROPROPENE	UG/L	2,500 U	250 U	250 U
CYCLOHEXANE	UG/L	2,500 U	250 U	250 U
DICHLOROMETHANE	UG/L	2,500 U	250 U	250 U
ETHYLBENZENE	UG/L	2,500 U	250 U	250 U
ISOPROPYLBENZENE (CUMENE)	UG/L	2,500 U	250 U	250 U
M,P-XYLENE (SUM OF ISOMERS)	UG/L	2,500 U	250 U	250 U
M-DICHLOROBENZENE	UG/L	2,500 U	250 U	250 U
METHYL ACETATE	UG/L	2,500 U	250 U	250 U
METHYL ETHYL KETONE (2-BUTANONE)	UG/L	5,000 U	500 U	500 U
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	UG/L	5,000 U	500 U	500 U
METHYL N-BUTYL KETONE	UG/L	5,000 U	500 U	500 U
METHYLBENZENE	UG/L	2,500 U	250 U	250 U
METHYLCYCLOHEXANE	UG/L	2,500 U	250 U	250 U
O-XYLENE (1,2-DIMETHYLBENZENE)	UG/L	2,500 U	250 U	250 U
STYRENE (MONOMER)	UG/L	2,500 U	250 U	250 U
TERT-BUTYL METHYL ETHER	UG/L	2,500 U	250 U	250 U
TETRACHLOROETHYLENE(PCE)	UG/L	2,500 U	250 U	250 U
TRANS-1,2-DICHLOROETHENE	UG/L	2,500 U	250 U	250 U
TRANS-1,3-DICHLOROPROPENE	UG/L	2,500 U	250 U	250 U
TRIBOMOMETHANE	UG/L	2,500 U	250 U	250 U
TRICHLOROETHYLENE	UG/L	730,000 J	23,000	22,000
VINYL CHLORIDE	UG/L	2,500 U	250 U	250 U
<b>Wet Chemistry</b>				
CHLORIDE (AS CL)	mg/L	1700 J	470	480
ETHANE	ug/L	3800	3,000 J	1,800 J
ETHYLENE	ug/L	7700	5,900 J	2,100 J
METHANE	ug/L	110	110 J	160 J

Attachment 1  
Validation Narratives

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
SUPERFUND DIVISION

DATE:

SUBJECT: Review of Data  
Received for Review on: 1 March 2012

FROM: Timothy Prendiville, Supervisor (SR-6J)  
Superfund Contract Management Section

TO: Data User: Ch2mHill  
Email Addresses: Shannon.olson@ch2m.com; dshekosk@ch2m.com

**Level 3 Data Validation**

We have reviewed the data for the following case:

SITE Name: Outboard Marine Corporation – OMC (IL)

Case Number: 42215 SDG Number: E5CS0

Number and Type of Samples: 9 Soils, 4 Waters (Low/Medium Volatiles)

Sample Numbers: E5CS0 – E5CS8, E5CW2 – E5CW5

Laboratory: KAP Technologies, Inc. Hrs for Review:

Following are our findings:

CC: Howard Pham  
Region 5 TPO  
Mail Code: SA-5J

Case Number: 42215  
Site Name: Outboard Marine Corporation - OMC (IL)

Page 2 of 10  
SDG Number: E5CS0  
Laboratory: KAP

**Below is a summary of the out-of-control audits and the possible effects on the data for this case:**

Nine (9) soil and four (4) water samples were shipped to KAP Technologies, Incorporated located in The Woodlands, TX. Nine (9) soil samples; E5CS0 through E5CS8 and four (4) preserved water samples; E5CW2 through E5CW5, were collected February 7-8, 2012 and received February 8-9, 2012 intact, but with cooler temperatures below 2°C.

All samples were analyzed for only the low/medium level volatile compounds. All samples were analyzed according to CLP SOW SOM01.2 and reviewed according to the NFG for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.6).

Soil sample, E5CS1, and water sample, E5CW3, were designated by the samplers to be used for laboratory QC, i.e. MS/MSD analyses.

Water sample E5CW2 was identified as a trip blank. Soil sample E5CS7 was identified as a field duplicate of soil sample E5CS6. Water sample E5CW5 was identified as a field duplicate of water sample E5CW4.

Case Number: 42215  
Site Name: Outboard Marine Corporation - OMC (IL)

SDG Number: E5CS0  
Laboratory: KAP

### 1. HOLDING TIME

The following preserved volatile water samples are outside primary holding time criteria. Detected compounds are qualified "J". Nondetected compounds are qualified "UJ".

E5CW3MS, E5CW3MSD

### 2. GC/MS TUNING AND GC INSTRUMENT PERFORMANCE

No problems were found.

### 3. CALIBRATION

The following volatile soil samples are associated with an initial calibration percent relative standard deviation (%RSD) outside criteria. The compound was not detected in the samples. Non-detected compounds are not qualified.

E5CS0, E5CS1, E5CS1MS, E5CS1MSD, E5CS2, E5CS3, E5CS4, E5CS5, E5CS6,  
E5CS7, E5CS8, VBLK01, VBLK90, VHBLK01  
Ethylbenzene

The following volatile water samples are associated with an initial calibration percent relative standard deviation (%RSD) outside criteria. Detected compounds are qualified "J". Non-detected compounds are not qualified. Non-detected compounds in samples E5CW3MS and E5CW3MSD are ultimately qualified "UJ" due to holding time criteria.

E5CW2, E5CW3, E5CW3DL, E5CW4, E5CW4DL, E5CW5, E5CW5DL, VBLK5S  
Bromoform

E5CW3MS, E5CW3MSD, VBLKCK, VHBLK02  
1,1-Dichloroethene, 1,2,3-Trichlorobenzene

The following volatile soil samples are associated with an opening CCV percent difference (%D) outside criteria. The compound was not detected in the samples. Non-detected compounds are qualified "UJ".

E5CS1MS, E5CS1MSD, VBLK01, VHBLK01  
1,2,3-Trichlorobenzene

The following volatile water samples are associated with an opening CCV percent difference (%D) outside criteria. The compound was not detected in the samples. Non-detected compounds are qualified "UJ".

E5CW3MS, E5CW3MSD, VBLKCK, VHBLK02  
Bromomethane

Case Number: 42215

SDG Number: E5CS0

Site Name: Outboard Marine Corporation - OMC (IL)

Laboratory: KAP

#### 4. BLANKS

The following volatile soil samples have common contaminant analyte concentrations reported less than 2x the CRQL. The associated method blank common contaminant concentration is less than 2x the concentration criteria. Detected compounds are qualified "U". Non-detected compounds are not qualified. Reported sample concentrations have been elevated to 2x the CRQL.

Methylene chloride  
E5CS1MS, E5CS1MSD, VHBLK01

The following volatile soil samples have TIC concentrations less than 5x the method blank concentration. The compounds were qualified "U" as non-detects and removed from the TIC Report.

Unknown @ 10.97  
E5CS0, E5CS1, E5CS2, E5CS3, E5CS4, E5CS5, E5CS6, E5CS7, E5CS8,  
VHBLK01

Unknown @ 19.41  
VHBLK01

The following volatile water samples have TIC concentrations less than 5x the method blank concentration. The compounds were qualified "U" as non-detects and removed from the TIC Report.

Unknown @ 10.70  
VHBLK02

Unknown @ 11.90  
E5CW2, E5CW3DL, E5CW4DL, E5CW5DL

The following volatile water samples have common contaminant analyte concentrations reported greater than or equal to 2x the CRQL and less than 4x the CRQL. The associated storage blank common contaminant concentration is less than 2x the concentration criteria. Detected compounds are qualified "U". Non-detected compounds are not qualified. The sample concentrations is reported as the adjusted CRQL. Non-detected compounds are ultimately qualified "UJ" due to holding time criteria.

E5CW3MS, E5CW3MSD  
Methylene chloride

Case Number: 42215

SDG Number: E5CS0

Site Name: Outboard Marine Corporation - OMC (IL)

Laboratory: KAP

**5. DEUTERATED MONITORING COMPOUND AND SURROGATE RECOVERY**

The following volatile soil samples have DMC/SMC recoveries above the upper limit of the criteria. Detected compounds are qualified "J". Non-detected compounds are not qualified.

E5CS1MSD

Cyclohexane, Benzene, Methylcyclohexane, 1,2-Dichloropropane,  
Bromodichloromethane

E5CS8

Dichlorofluoromethane, Chloromethane, Bromomethane, Chloroethane,  
Carbon disulfide

The following volatile soil samples have DMC/SMC recoveries below the expanded lower limit of the criteria window. The compound was not detected in the sample. Non-detected compounds are qualified "R".

E5CS4

1,4-Dioxane

The following volatile water samples have DMC/SMC recoveries above the upper limit of the criteria. Detected compounds are qualified "J". Non-detected compounds are not qualified.

E5CW3MS, E5CW3MSD

1,1-Dichloroethene, trans-1,2-Dichloroethene, cis-1,2-Dichloroethene

**6A. MATRIX SPIKE/MATRIX SPIKE DUPLICATE**

Soil sample, E5CS1, and water sample, E5CW3, were designated by the samplers to be used for laboratory QC, i.e. MS/MSD analyses.

The following volatile water matrix spike/matrix spike duplicate samples have percent recoveries that are less than the expanded lower acceptance limit. The compound in the unspiked samples, E5CW3 and E5CW3DL, is qualified "J".

E5CW3MS, E5CW3MSD

Trichloroethene

**6B. LABORATORY CONTROL SAMPLE**

Not applicable to this sample delivery group.

Case Number: 42215  
 Site Name: Outboard Marine Corporation - OMC (IL)

SDG Number: E5CS0  
 Laboratory: KAP

## 7. FIELD BLANK AND FIELD DUPLICATE

Water sample E5CW2 was identified as a trip blank. No target compounds or TICs are reportable for this sample.

Soil sample E5CS7 was identified as a field duplicate of soil sample E5CS6.

Volatile compounds	E5CS6	E5CS7	%RPD
	Df = 1.0	Df = 1.0	
Acetone	80	67	18
Methylene chloride		2.1	200
Trichloroethene	42	65	43
Toluene	4.2	3.7	13

Water sample E5CW5 was identified as a field duplicate of water sample E5CW4.

Volatile compounds	E5CW4	E5CW5	RPD	E5CW4DL	E5CW5DL	RPD
	Df = 1.0	Df = 1.0		Df = 400.0	Df = 400.0	
Trichloroethene	25000	25000	0.0	23000	22000	4.4
Cis-1,2-Dichloroethene	24000	25000	4.1	48000	47000	2.1
Number of TICs	1	1				

Results are not qualified based upon the results of the field duplicates.

## 8. INTERNAL STANDARDS

No problems were found.

## 9. COMPOUND IDENTIFICATION

After reviewing the mass spectra and chromatograms it appears that all VOA compounds were properly identified.

## 10. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS

The following low level volatile soil samples have analyte concentrations below the quantitation limit (CRQL). Detected compounds are qualified "J".

E5CS0, E5CS3, VBLK01  
 Methylene chloride

E5CS1  
 Cis-1,2-Dichloroethene

Case Number: 42215  
Site Name: Outboard Marine Corporation - OMC (IL)

SDG Number: E5CS0  
Laboratory: KAP

E5CS2  
1,2,4-Trichlorobenzene, 1,2,3-Trichlorobenzene

E5CS4  
Trichloroethene

E5CS5  
Methylene chloride, Trichloroethene

E5CS6  
Toluene

E5CS7  
Methylene chloride, Toluene

E5CS8  
Cis-1,2-Dichloroethene, Toluene

The following low level volatile water samples have analyte concentrations below the quantitation limit (CRQL). Detected compounds are qualified "J".

E5CW3DL  
Cis-1,2-Dichloroethene

A library search indicates a match above 85% for a TIC compound in the volatile sample. Detected compounds are qualified "NJ".

CAS No. 78-80-8    1-Buten-3-yne, 2-methyl-    (RT @ 4.3)  
E5CS4

CAS No. 592-41-6    1-Hexene    (RT @ 5.3)  
E5CS7

CAS No. 542-92-7    1,3-Cyclopentadiene    (RT @ 4.3)  
E5CS0, E5CS1

CAS No. 763-29-1    1-Pentene, 2-methyl-    (RT @ 5.2)  
E5CS6, E5CS8

A library search indicates a match below 85% for a TIC compound in the volatile sample. Detected compounds are qualified "J".

Unknown @ 10.69  
VBLKCK

Case Number: 42215  
Site Name: Outboard Marine Corporation - OMC (IL)

Page 8 of 10  
SDG Number: E5CS0  
Laboratory: KAP

Unknown @ 10.95  
VBLK01, VBLK90

Unknown @ 11.90  
VBLK5S

Unknown @ 19.39  
VBLK01

Unknown @ 20.50  
E5CW4, E5CW5

## 11. SYSTEM PERFORMANCE

GC/MS baseline indicated acceptable performance.

## 12. ADDITIONAL INFORMATION

The following volatile water samples reported compounds with concentrations that exceeded the instrument's calibration range. The detected compound is qualified "J". The results from the diluted analyses should be considered the final compound concentration.

Cis-1,2-Dichloroethene  
E5CW4, E5CW5

Trichloroethene  
E5CW3, E5CW4, E5CW5

The following volatile water samples reported compounds with concentrations that exceeded the instrument's calibration range. The detected compound is qualified "J". No dilutions were conducted because these are QC samples.

E5CW3MS, E5CW3MSD  
Trichloroethene

The following volatile soil samples had Tentatively Identified Compounds (both Unknown and with CAS No.) deleted from the TIC lists because they are common laboratory artifacts/contaminants – e.g. Aldol condensation products, solvent preservatives, and reagent contaminants. They were qualified as not reported in the Sample Summary Report.

CAS No. 541-05-9 Cyclotrisiloxane, hexamethyl-  
E5CS2, E5CS4, E5CS5

CAS No. 556-67-2 Cyclotetrasiloxane, octamethyl-  
E5CS0, E5CS1, E5CS2, VBLK01, VHBLK01

Reviewed by: Allison Harvey / Techlaw-ESAT  
Date: March 8, 2012

Case Number: 42215

SDG Number: E5CS0

Site Name: Outboard Marine Corporation - OMC (IL)

Laboratory: KAP

Unknown @ 15.96

E5CS5, VBLK90

The following volatile samples reported separate TICs with retention times so similar, the Reviewer determined they were the same peak rather than two separate peaks and were therefore evaluated as only one TIC.

CAS No. 763-29-1 1-Pentene, 2-methyl- @ RT 5.24 and

Unknown @ RT 5.25

E5CS6

CAS No. 592-41-6 1-Hexene @ RT 5.28 and

Unknown @ RT 5.32

E5CS7

CAS No. 763-29-1 1-Pentene, 2-methyl- @ RT 5.28 and

Unknown @ RT 5.32

E5CS8

The following volatile samples were analyzed after instrument blanks that reported target compounds with concentrations greater than the CRQL. The reported results may be affected by crossover. Reported concentrations are qualified "J". Non-detected compounds are not qualified for this criterion.

E5CW3MSD (VIBLK20),

VHBLK02 (VIBLK21)

Methylene chloride

Reviewed by: Allison Harvey / Techlaw-ESAT

Date: March 8, 2012

CADRE Data Qualifier Sheet

Qualifiers

Data Qualifier Definitions

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification and the associated numerical value represents its approximate concentration.
R	The data are unusable. (The compound may or may not be present.)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
SUPERFUND DIVISION

DATE:

SUBJECT: Review of Data  
Received for Review on: March 1, 2012

FROM: Timothy Prendiville, Supervisor (SR-6J)  
Superfund Contract Management Section

TO: Data User: CH2M HILL  
Email address: dshekosk@ch2m.com

**Level 3 Data Validation**

We have reviewed the data for the following case:

Site Name: Outboard Marine Corp - OMC (IL)

Case Number: 42215 SDG Number: E5CS9

Number and Type of Samples: 13 soil samples (low level VOA)

Sample Numbers: E5CS9, E5CT0 - E5CT9, E5CW0, E5CW1

Laboratory: KAP Technologies, Inc. Hrs for Review: \_\_\_\_\_

Following are our findings:

CC: Howard Pham  
Region 5 TPO  
Mail Code: SA-5J

Case Number: 42215  
Site Name: Continental Steel Corp. (IN)

Page 2 of 8  
SDG Number: E5CS9  
Laboratory: KAP

**Below is a summary of the out-of-control audits and the possible effects on the data for this case:**

Thirteen (13) soil samples labeled E5CS9, E5CT0 – E5CT9, E5CW0 and E5CW1 were collected on 02/08/2012. The samples were received by KAP Technologies, Inc. located in The Woodlands, TX on 02/09/2012. All samples arrived intact but below the proper shipping temperature range of 2 - 6°C. The samples were analyzed for the low level volatile target compounds according to CLP SOW SOM01.2 (6/2007). The samples were reviewed according to the NFG for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.6).

None of the samples in this SDG were designated by the samplers to be used for laboratory QC, i.e. MS / MSD analyses. Sample E5CT5 was used for low level MS / MSD volatile analyses.

No samples were identified as field blanks. Sample E5CT5 was identified as field duplicate of samples E5CT4.

Case Number: 42215  
Site Name: Continental Steel Corp. (IN)

Page 3 of 8  
SDG Number: E5CS9  
Laboratory: KAP

#### 1. **HOLDING TIME**

No problems were found.

#### 2. **GC/MS TUNING AND GC INSTRUMENT PERFORMANCE**

No problems were found.

#### 3. **CALIBRATION**

The following volatile samples are associated with an initial calibration percent relative standard deviation (%RSD) outside criteria. The compound was not detected in the samples. Non-detected compounds are not qualified.

E5CS9, E5CS9DL, E5CT0, E5CT1, E5CT2, E5CT3, E5CT3DL, E5CT4, E5CT5,  
E5CT5MS, E5CT5MSD, E5CT6, E5CT6DL, E5CT7, E5CT7DL, E5CT8,  
E5CT8DL, E5CT9, E5CT9DL, E5CW0, E5CW0DL, E5CW1, E5CW1DL,  
VBLK01, VBLK92, VBLK94, VBLK96  
Ethylbenzene

The following volatile samples are associated with an opening CCV percent difference (%D) outside criteria. Detected compounds are qualified "J". Non-detected compounds are not qualified. The non-detected compound in E5CW1 is ultimately qualified "R" due to internal standard criteria.

E5CW0, E5CW0DL, E5CW1, VBLK96  
Bromoform

E5CS9, E5CS9DL, E5CT0, E5CT1, E5CT2, E5CT3, E5CT3DL, E5CT4, E5CT5,  
E5CT5MS, E5CT5MSD, E5CT6, E5CT6DL, E5CT7, E5CT7DL, E5CT8,  
E5CT8DL, E5CT9, E5CT9DL, E5CW1DL, VBLK01, VBLK92, VBLK94  
1,2,3-Trichlorobenzene

#### 4. **BLANKS**

Instrument blanks were analyzed following the highly contaminated samples or samples with compounds that exceeded calibration range. Trichloroethene was not detected or detected below the CRQL in the instrument blanks. Therefore, no carryover problems were found.

The following volatile samples have common contaminant analyte concentrations reported less than 2x the CRQL. The associated method blank common contaminant concentration is less than 2x the concentration criteria. Detected compounds are qualified "U". Non-detected compounds are not qualified. Reported sample concentrations have been elevated to 2X the CRQL.

Case Number: 42215  
Site Name: Continental Steel Corp. (IN)

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SDG Number: E5CS9  
Laboratory: KAP

Methylene chloride

E5CS9, E5CS9DL, E5CT0, E5CT1, E5CT2, E5CT3, E5CT3DL, E5CT4, E5CT5,  
E5CT5MS, E5CT6, E5CT6DL, E5CT7, E5CT7DL, E5CT8, E5CT8DL, E5CT9DL,  
E5CW1, E5CW1DL, VHBLK01

The following volatile samples have TIC concentrations reported less than 5X the method blank concentration. Detected compounds are qualified "U" and deleted from the TIC report.

Unknown @ 10.95 – 11.00

E5CS9, E5CS9DL, E5CT0, E5CT1, E5CT2, E5CT3, E5CT3DL, E5CT4, E5CT5,  
E5CT6DL, E5CT7DL, E5CT8DL, E5CT9DL, E5CW0DL, E5CW1, E5CW1DL,  
VHBLK01

Unknown @ 19.38 – 19.40

E5CT3DL, E5CT6DL, E5CT7, E5CT7DL, E5CT8, E5CT9, E5CW0DL, E5CW1

Unknown @ 22.76

VHBLK01

## 5. DEUTERATED MONITORING COMPOUND AND SURROGATE RECOVERY

The following volatile samples have DMC/SMC recoveries above the upper limit of the criteria window. Detected compounds are qualified "J". Non-detected compounds are not qualified.

E5CT5

1,4-Dioxane

E5CT8

Dichlorodifluoromethane, Chloromethane, Bromomethane, Chloroethane,  
Trichlorofluoromethane, 1,1,2-Trichloro-1,2,2-trifluoroethane, Carbon Disulfide,  
Methyl Acetate, Methylene Chloride, Methyl tert-Butyl Ether, 1,1,1-Trichloroethane,  
Carbon Tetrachloride, 1,2-Dichloroethane, 1,2-Dibromoethane

E5CW1

Cyclohexane, Benzene, Trichloroethene, Methylcyclohexane, 1,2-Dichloropropane,  
Bromodichloromethane, Toluene, Tetrachloroethene, Ethylbenzene, o-Xylene,  
m,p-Xylene, Styrene, Isopropylbenzene

The following volatile sample has DMC/SMC recovery value is less than the primary lower limit but greater than or equal to the expanded lower limit of the criteria window. The compound was not detected in the sample. Non-detected compound is qualified "UJ".

E5CT6DL

1,4-Dioxane

Case Number: 42215  
Site Name: Continental Steel Corp. (IN)

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SDG Number: E5CS9  
Laboratory: KAP

**6A. MATRIX SPIKE/MATRIX SPIKE DUPLICATE**

None of the sample in this SDG was designated by the samplers to be used for laboratory QC, i.e. MS / MSD analyses. Sample E5CT5 was used for low level MS / MSD volatile analyses.

No problems were found.

**6B. LABORATORY CONTROL SAMPLE**

Not applicable to this analysis.

**7. FIELD BLANK AND FIELD DUPLICATE**

No samples were identified as field blanks. Sample E5CT5 was identified as field duplicate of samples E5CT4. Results for the duplicate samples are summarized in the following table:

Analytes	Sample ID	E5CT4	E5CT5	RPDs
	DF, units	1, ug/Kg	1, ug/Kg	
Acetone		ND	33	200
cis-1,2-Dichloroethene		16	8.4	62
Trichloroethene		91	52	54

Results are not qualified based upon the results of the field duplicates.

**8. INTERNAL STANDARDS**

The following volatile samples have internal standard area counts that are outside the lower limit of primary criteria. The compounds were not detected in the sample. Non-detected compounds are qualified "R".

E5CW1

Bromoform, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichlorobenzene,  
1,2-Dibromo-3-chloropropane, 1,2,4-Trichlorobenzene, 1,2,3-Trichlorobenzene

**9. COMPOUND IDENTIFICATION**

After reviewing the mass spectra and chromatograms it appears that all volatile compounds were properly identified.

**10. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS**

During the data validation process, it has come to the attention of several reviewers that the data generated by the laboratory appears to have an error in the formula used to correct positive

Case Number: 42215  
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SDG Number: E5CS9  
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results in VOA soils for sample size and percent moisture. The reported CRQLs and the results for TIC compounds are correct when using the formula as stated in the SOW SOM01.2. When the same formula is used to calculate the final results for detected compounds, the calculated results are about one-half what is reported on the FORM Is or final result tables in EXES. This error is also duplicated with the blank results. It is the opinion of the reviewers that somewhere in the data reduction process at the laboratory an erroneous formula or data input is occurring.

The following volatile samples have compound concentrations less than the CRQL. Detected compounds are qualified "J".

E5CT0  
Trichloroethene

E5CT7, E5CW1  
cis-1,2-Dichloroethene

E5CT9  
Tetrachloroethene

E5CW0  
cis-1,2-Dichloroethene, Tetrachloroethene, m,p-Xylene

VBLK01, VBLK10, VBLK94, VBLK96  
Methylene chloride

A library search indicates a match at or above 85% for a TIC compounds in the volatile samples. Detected compounds are qualified "NJ".

CAS No. 78-80-8 1-Buten-3-yne, 2-methyl-  
E5CT1

CAS No. 103-09-3 Acetic acid, 2-ethylhexyl ester  
E5CT9

A library search indicates a match below 85% for a TIC compounds in the volatile samples. Detected compounds are qualified "J".

Unknown @ 10.95 - 11.00  
VBLK01, VBLK10, VBLK92, VBLK94, VBLK96

Unknown @ 11.39  
E5CS9

Unknown @ 18.38  
E5CT7

Reviewed by: Steffanie Tobin/Techlaw-ESAT  
Date: March 12, 2012

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SDG Number: E5CS9  
Laboratory: KAP

Unknown @ 19.4  
E5CT6, VBLK01, VBLK10, VBLK94, VBLK96

Unknown @ 22.72  
E5CT3DL, E5CT6, E5CT7, E5CT8, E5CW1DL, VBLK10, VBLK96

## 11. SYSTEM PERFORMANCE

GC/MS baseline indicated acceptable performance.

## 12. ADDITIONAL INFORMATION

TICs with no CAS Numbers were not reported in the EXES Sample Summary Report for the volatile and semivolatile fractions. Please refer to Word document "42215 sdg E5CS9 TIC" for the validated TIC results.

The following volatile samples have compound concentrations which exceed the instruments calibration range. The detected results are qualified "J". The results from the diluted analyses should be considered the final concentrations for the affected compounds.

E5CS9, E5CT3, E5CT6, E5CT7, E5CT8, E5CT9, E5CW0, E5CW1  
Trichloroethene

The following volatile soil samples had Tentatively Identified Compounds (both Unknown and with CAS No.) deleted from the TIC lists because they are common laboratory artifacts/contaminants – e.g. Aldol condensation products, solvent preservatives, and reagent contaminants. They were qualified as not reported in the Sample Summary Report.

CAS No. 541-05-9 Cyclotrisiloxane, hexamethyl-  
E5CT3, E5CT5, E5CT7DL, E5CT8, E5CT8DL, E5CW0DL, VBLK92, VHBLK01

CAS No. 556-67-2 Cyclotetrasiloxane, octamethyl-  
E5CT0, E5CT2, E5CT3, E5CT5, E5CW1, E5CW1DL, VBLK01, VBLK94

Unknown @ 15.96  
E5CS9, E5CT4, E5CT6, E5CT8DL, VBLK92

Case Number: 42215  
Site Name: Continental Steel Corp. (IN)

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SDG Number: E5CS9  
Laboratory: KAP

CADRE Data Qualifier Sheet

<u>Qualifiers</u>	<u>Data Qualifier Definitions</u>
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification and the associated numerical value represents its approximate concentration.
R	The data are unusable. (The compound may or may not be present.)

June 2012

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# Data Usability Evaluation—June 2012 OMC Plant 2 Site, Waukegan, Illinois WA No. 151-RARA-0528, Contract No. EP-S5-06-01

PREPARED FOR: U.S. Environmental Protection Agency

PREPARED BY: Adrienne Korpela/CH2M HILL

DATE: July 30, 2012

This memorandum presents the results of the data usability evaluation of groundwater data from the Outboard Marine Corporation (OMC) Plant 2 site in Waukegan, Illinois. The samples were collected in June 2012 and analyzed by a laboratory in the U.S. Environmental Protection Agency's (USEPA's) Contract Laboratory Program (CLP). The analytical results will be used to evaluate the effectiveness of the in situ soil mixing component of the TCE DNAPL remedy.

## Analytical Data

A total of 4 groundwater samples, including quality control (QC) samples were collected and shipped by overnight carrier to the laboratories for analysis. The analytical parameter class, methodology, and laboratory performing the analysis are shown in Table 1.

TABLE 1  
Analytical Parameters  
*OMC Plant 2*

Parameter Class	Method	Laboratory
Volatile organic compounds (VOCs)	CLP SOW SOM01.2	PEL Laboratories Tampa, Florida
Polychlorinated biphenyls (PCBs)	CLP SOW SOM01.2	PEL Laboratories Tampa, Florida
Arsenic	CLP SOW ISM01.3	A4 Scientific, Inc. The Woodlands, Texas

As part of the quality assurance process outlined in the site-specific quality assurance project plan (CH2M HILL 2012), QC samples were collected in the field to complement the assessment of overall data quality and usability. The QC samples consisted of an equipment blank, a VOC trip blank, and QC associated with other samples in the sample delivery group (SDG).

The data assessment process was completed by the Sample Management Office (SMO). The data set was then reviewed by USEPA's Environmental Service Assistance Team contractor, TechLaw, to assess the accuracy and precision of the method and the matrix using the appropriate criteria established in the National Functional Guidelines and to verify that the data set was complete. USEPA validators added data qualifiers when the QC statistics indicated a possible bias to specific compounds or analytes associated with a particular method and sample batch. Attachment 1 contains the case narratives prepared by TechLaw ESAT during data reviews.

Standard data qualifiers are a means to classify these data with regard to their conformance to QC requirements. The applied data qualifiers are defined as follows:

[U] The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

- [J] The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- [J+] The result is an estimated quantity, but the result may be biased high.
- [J-] The result is an estimated quantity, but the result may be biased low.
- [UJ] The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- [R] The data are unusable. The sample results are rejected due to serious deficiencies in meeting Quality Control (QC) criteria. The analyte may or may not be present in the sample.

CH2M HILL reviewed the validation performed by USEPA for the samples in Case Number 42622, sample delivery groups E4KP0 and ME4KP0. Table 2 presents the station locations and sample identifications (IDs).

TABLE 2  
Sample Summary by Sample ID and Location  
OMC Plant 2

Station Location	Organic Sample ID	Inorganic Sample ID	Station Location	Organic Sample ID	Inorganic Sample ID
OMC-TW001	E4KQ8	ME4KQ8	EB	E4KQ6	ME4KQ6
OMC-TW002	E4KQ9	ME4KQ9	TB	E4KQ7	-

EB = equipment blank

TB = trip blank

The USEPA validation case narratives and worksheets indicate that some sample results should be qualified as biased based on the applicable QC limits or other National Functional Guidelines requirements. The narratives and worksheets are presented in Attachment 1.

The following sections summarize the data validation findings and usability of the final reportable results. The sample numbers and locations summarized below do not include the quality assurance/QC samples.

### Volatile Organic Compound Data

The VOC data set consists of the results for 51 analytes for each of the 2 temporary monitoring wells, resulting in 102 results.

The data validation summary indicates the following:

- UJ, and J qualifiers were applied to sample results that were potentially affected by QC deficiencies.
- Nondetected sample results were qualified U.
- Forty-six of the reported VOC results were rejected. The internal standard area counts were below the lower limit of criteria for sample E4KQ9. The nondetected sample results were qualified "R" as unusable.

Fifty-five percent of the VOC data, as qualified, can be used to make project decisions.

### Polychlorinated Biphenyl Aroclor Data

The polychlorinated biphenyl (PCB) Aroclor data set consists of the results for 9 Aroclors for each of the 2 temporary wells, resulting in 18 results.

The validation summary of the PCB Aroclor data indicates the following:

- All of the samples were nondetect for PCBs and qualified U.
- None of the reported PCB results were rejected.

One hundred percent of the PCB data, as qualified, can be used to make project decisions.

## Metals Data

The total metals data set consists of arsenic results for each of the 2 temporary wells, resulting in 2 results.

The validation summary of the arsenic data indicates the following:

- None of the reported arsenic results were qualified or rejected.

One hundred percent of the arsenic data can be used to make project decisions.

## Overall Assessment

The final activity in the data quality evaluation is an assessment of whether the data meet the data quality objectives. The goal of the assessment was to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision making process. The following summary highlights the data evaluation findings for the above-defined events:

1. The completeness objective of 90 percent was met for all method/analyte combinations except for VOCs, which was 55 percent.
2. The precision and accuracy of the data, as measured by field and laboratory QC indicators, indicate that the data quality objectives were met.

The data summary tables are included at the end of this document.

## Reference Cited

CH2M HILL. 2012. *Quality Assurance Project Plan, OMC Plant 2 Site, Waukegan, Illinois*. WA No. 105-RARA-0528 Contract No. EP-S5-06-01. April.

USEPA. 2008. *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*. June.

USEPA. 2004. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. October.

**Attachment 1**  
**Validation Narratives**

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**Regional Transmittal Form**

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION V**

**DATE:** 7/5/2012

**SUBJECT:** **Review of Data**  
Received for review on 7/2/2012

**FROM:** **Timothy Prendiville, Supervisor, Chief (SR-6J)**  
**Superfund Contract Management Section**

**TO:** **Data User:** CH2M Hill  
**Email address:** dshekosk@CH2M.com

**LEVEL 3 DATA VALIDATION**

**We have reviewed the data for the following case:**

**SITE NAME:** Outboard Marine Corporation (IL)

**CASE NUMBER:** 42622 **SDG NUMBER:** ME4KP0

**Number and Type of Samples:** 19 waters

**Sample Numbers:** ME4KP0 – P9, ME4KQ0 – Q6, ME4KQ8 – Q9

**Laboratory:** A4 Scientific **Hrs. for Review:** \_\_\_\_\_

**Following are our findings:**

CC: Howard Pham  
Region 5 TPO  
Mail Code: SA-5J

**Below is a summary of the out-of-control audits and the possible effects on the data for this case:**

Nineteen (19) water samples, numbered ME4KP0 – P9, ME4KQ0 – Q6, and ME4KQ8 – Q9 were collected June 6 – 8, 2012. The lab received the samples on June 9, 2012 in good condition. All samples were analyzed for arsenic. All samples were analyzed using the CLP SOW ISM01.3 analysis procedures.

The inorganic analysis was performed using an Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS) procedure.

**1. HOLDING TIME:**

No defects were found.

**2. CALIBRATIONS:**

No defects were found for the calibrations.

**3. BLANKS:**

No defects were found for the preparation blank or ICB/CCBs.

ME4KQ6 is identified as a field blank. No contamination was present.

**4. MATRIX SPIKE/MATRIX SPIKE DUPLICATE AND LAB CONTROL SAMPLE:**

No defects were found for matrix spike or laboratory control samples.

**5. LABORATORY AND FIELD DUPLICATE:**

No defects were found for the laboratory duplicate samples.

ME4KQ1/Q2 and ME4KQ3/Q5 are field duplicate pairs. No defects were found for the field duplicate samples.

**6. ICP ANALYSIS:**

No defects were found for the tune, internal standards, ICS samples or serial dilution sample.

**7. SAMPLE RESULTS:**

All data, except those qualified above, are acceptable.

**EXES ISM01.3 Data Qualifier Sheet**

<u>Qualifiers</u>	<u>Data Qualifier Definitions</u>
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
R	The data are unusable. The sample results are rejected due to serious deficiencies in meeting Quality Control (QC) criteria. The analyte may or may not be present in the sample.
UJ	The analyte was analyzed for, but not detected. The reported quantitation limit is <i>approximate and may be inaccurate or imprecise</i> .

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION V  
SUPERFUND DIVISION

DATE:

SUBJECT: Review of Data  
Received for Review on: July 2, 2012

FROM: Timothy Prendiville, Supervisor (SR-6J)  
Superfund Contract Management Section

TO: Data User: CH2M HILL  
Email address: dshekosk@ch2m.com

**Level 3 Data Validation for EXES database**

We have reviewed the data for the following case:

Site Name: Outboard Marine Corporation (IL)

Case Number: 42622 SDG Number: E4KP0

Number and Type of Samples: 20 water samples (20 trace VOA, 18 Aroclor)

Sample Numbers: E4KP0 – E4KP9, E4KQ0 – E4KQ9

Laboratory: Spectrum Analytical, Inc. – PEL Hrs for Review: \_\_\_\_\_

Following are our findings:

CC: Howard Pham  
Region 5 TPO  
Mail Code: SA-5J

Case Number: 42622  
Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP0  
Laboratory: Spectrum Anal. - PEL

**Below is a summary of the out-of-control audits and the possible effects on the data for this case:**

Twenty (20) preserved water samples labeled E4KP0 – E4KP9 and E4KQ0 – E4KQ9 were collected 06/05/12 thru 06/08/12. The samples were received by Spectrum Analytical, Inc. located in Tampa, FL on 06/09/12. All samples arrived at the proper shipping temperature range of 2 - 6°C. The containers for aroclor sample E4KP6 were broken upon receipt; therefore, the aroclor analysis was canceled for this sample. Eighteen (18) samples E4KP0 – E4KP5, E4KP7 – E4KP9, E4KQ0 – E4KQ6, E4KQ8 and E4KQ9 were analyzed for the trace volatile and aroclor target compounds. Samples E4KP6 and E4KQ7 were analyzed for only the trace volatile target compounds. All samples were analyzed according to CLP SOW SOM01.2 (6/2007) and reviewed according to the NFG for SOM01.2 and the SOP for ESAT 5/TechLaw Validation of Contract Laboratory Program Organic Data (Version 2.6.2).

Sample E4KP1 was designated by the samplers to be used for laboratory QC, i.e. MS / MSD analyses.

Sample E4KQ6 was identified as equipment blank. Samples E4KQ1/E4KQ2 and E4KQ3/E4KQ5 are the field duplicate pairs. The Reviewer did not evaluate sample E4KQ7 (station location OMC-JS01) as a trip blank even though the “JS” in the station location ID sometimes represents a trip blank designation. Sample E4KQ7 contained Chloroform at 2.0 µg/L. Chloroform was also detected in sample E4KP5 at 1.1 µg/L.

Case Number: 42622  
Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP0  
Laboratory: Spectrum Anal. - PEL

### 1. HOLDING TIME

Following volatile preserved water samples exceeded primary technical holding time criteria. Detected compounds are qualified "J". Non-detected compounds are qualified "UJ".

E4KQ0DL2

### 2. GC/MS TUNING AND GC INSTRUMENT PERFORMANCE

No problems were found.

### 3. CALIBRATION

The following trace volatile samples are associated with an initial calibration percent relative standard deviation (%RSD) outside criteria. Bromomethane was not detected in the samples. Non-detected Bromomethane is not qualified for this criterion. Non-detected Bromomethane in E4KQ0DL2 is ultimately qualified as "UJ" because holding time criteria was not met.

E4KQ0DL2, VBLK1G, VHBLK1S  
Bromomethane

The following trace volatile samples are associated with an opening CCV percent difference (%D) outside criteria. Detected compounds are qualified "J". Non-detected compounds are qualified "UJ".

E4KP0, E4KP1, E4KP1MS, E4KP1MSD, E4KP2, E4KP3, E4KP4, E4KP5, E4KP6,  
E4KP7, E4KP8, E4KP9, E4KQ0, E4KQ1, E4KQ2, E4KQ3DL, E4KQ4, E4KQ5,  
E4KQ6, E4KQ7, E4KQ8, E4KQ9, VBLK1A  
Vinyl chloride

The following volatile samples are associated with an opening CCVs in which a DMC exceeded percent difference (%D) criteria. Detected and non-detected compounds are not qualified based on the %D data of the DMC alone.

E4KP0, E4KP1, E4KP1MS, E4KP1MSD, E4KP2, E4KP3, E4KP4, E4KP5, E4KP6,  
E4KP7, E4KP8, E4KP9, E4KQ0, E4KQ1, E4KQ2, E4KQ3DL, E4KQ4, E4KQ5,  
E4KQ6, E4KQ7, E4KQ8, E4KQ9, VBLK1A  
Vinyl chloride-d<sub>3</sub>

The following volatile samples are associated with the closing CCVs in which a DMC exceeded percent difference (%D) criteria. Detected and non-detected compounds are not qualified based on the %D data of the DMC alone.

Case Number: 42622  
Site Name: Outboard Marine Corporation (IL)

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SDG Number: E4KP0  
Laboratory: Spectrum Anal. - PEL

E4KP0DL, E4KP1DL, E4KP1DLMS, E4KP1DLMSD, E4KP4DL, E4KP7DL,  
E4KP9DL, E4KQ0DL, E4KQ1DL, E4KQ2DL, E4KQ3, VBLK1B  
2-Hexanone-d<sub>5</sub>

#### 4. BLANKS

The following trace volatile samples were analyzed after a highly contaminated sample with no preceding instrument blank. There is a possibility of carryover; therefore, detected compounds are qualified as "J". Some of these results were also quantitated outside the calibration range.

E4KP1, E4KP1MS, E4KP1MSD, E4KP4, E4KQ1, E4KQ1DL  
cis-1,2-Dichloroethene

E4KQ2  
Trichloroethene

The following trace volatile samples have common contaminant analyte concentrations reported less than 2X the CRQL. The associated method blank has common contaminant analyte concentration is less than 2X the concentration criteria. Detected compounds are qualified "U". Non-detected compounds are not qualified. Reported sample concentrations have been elevated to 2X the CRQL. Methylene chloride result in E4KQ0DL2 is ultimately qualified as "UJ" because holding time criteria was not met.

Acetone  
E4KP1DL, E4KP1DLMS, E4KP1DLMSD, E4KQ8RE, E4KQ9DL, VHBLK1S

Methylene chloride  
E4KP0DL, E4KP1DL, E4KP1DLMS, E4KP1DLMSD, E4KP4DL, E4KP7DL,  
E4KP9DL, E4KQ0DL, E4KQ0DL2, E4KQ1DL, E4KQ2DL, E4KQ3, E4KQ3DL,  
E4KQ4

The following trace volatile sample has common contaminant analyte concentrations reported greater than 2X the CRQL but less than 4X the CRQL. The associated method blank has common contaminant analyte concentration is less than 2X the concentration criteria. Detected compounds are qualified "U". Non-detected compounds are not qualified. Reported sample concentration has been elevated to 4X the CRQL.

Methylene chloride  
VHBLK1S

The following trace volatile samples have common contaminant analyte concentrations reported less than 2X the CRQL. The associated equipment blank has common contaminant analyte concentration is less than 2X the concentration criteria. Detected compounds are qualified "U". Acetone result in E4KQ9 is qualified "R" because not all IS criterion was met. Non-detected

Case Number: 42622  
Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP0  
Laboratory: Spectrum Anal. - PEL

compounds are not qualified. Reported sample concentrations have been elevated to 2X the CRQL.

Acetone

E4KP0, E4KP1, E4KP1MS, E4KP1MSD, E4KP5, E4KP9, E4KQ3, E4KQ3DL,  
E4KQ4, E4KQ9

The following volatile samples have TIC concentrations reported less than 5X the equipment blank (E4KQ6) concentration. Detected compounds are qualified "U" and deleted from the TIC report.

CAS No. 96-76-4 Phenol, 2,4-bis(1,1-dimethylethyl)-  
E4KP0, E4KQ7, E4KQ9DL

## 5. DEUTERATED MONITORING COMPOUND AND SURROGATE RECOVERY

The following volatile samples have deuterated monitoring compound recovery below the lower limit of the criteria window and greater than the expanded limit (20%). Detected compounds are qualified "J". Non-detected compounds are qualified "UJ". Some non-detects are ultimately qualified as "R" because not all IS criteria was met.

E4KP0

Vinyl Chloride

E4KP1MS

Dichlorodifluoromethane, Chloromethane, Bromomethane, Chloroethane,  
Carbon Disulfide

E4KP1MSD, E4KP2, E4KQ8, E4KQ9

Cyclohexane, Methylcyclohexane, 1,2-Dichloropropane, Bromodichloromethane

E4KP1LDMSD

1,1-Dichloroethane, Bromochloromethane, Chloroform, Cyclohexane,  
Methylcyclohexane, 1,2-Dichloropropane, Bromodichloromethane,  
Dibromochloromethane, Trichloroethene, Toluene, Tetrachloroethene, Ethylbenzene,  
o-Xylene, m,p-Xylene, Styrene, Bromoform, Isopropylbenzene

E4KP4DL, E4KP7DL

Cyclohexane, Trichloroethene, Methylcyclohexane, 1,2-Dichloropropane,  
Bromodichloromethane, Toluene, Tetrachloroethene, Ethylbenzene, o-Xylene,  
m,p-Xylene, Styrene, Isopropylbenzene

Case Number: 42622  
Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP0  
Laboratory: Spectrum Anal. - PEL

E4KP5

Dichlorodifluoromethane, Chloromethane, Vinyl Chloride, Bromomethane, Chloroethane, Carbon Disulfide, Cyclohexane, Methylcyclohexane, 1,2-Dichloropropane, Bromodichloromethane

E4KP6

Dichlorodifluoromethane, Chloromethane, Bromomethane, Chloroethane, Carbon Disulfide, Cyclohexane, Methylcyclohexane, 1,2-Dichloropropane, Bromodichloromethane

E4KP8, E4KQ4

Cyclohexane, Benzene, Methylcyclohexane, 1,2-Dichloropropane, Bromodichloromethane

E4KQ0

Dichlorodifluoromethane, Chloromethane, Vinyl chloride, Bromomethane, Chloroethane, 1,1-Dichloroethene, Carbon disulfide, trans-1,2-Dichloroethene, 1,1-Dichloroethane, cis-1,2-Dichloroethene, Bromochloromethane, Chloroform, Cyclohexane, Methylcyclohexane, 1,2-Dichloropropane, Bromodichloromethane, Dibromochloromethane, Bromoform

E4KQ2

Dichlorodifluoromethane, Chloromethane, Vinyl Chloride, Bromomethane, Chloroethane, Carbon Disulfide

E4KQ7

Dichlorodifluoromethane, Chloromethane, Bromomethane, Chloroethane, Carbon disulfide, 1,1-Dichloroethane, Bromochloromethane, Chloroform, Dibromochloromethane, Bromoform

E4KQ8RE

1,1-Dichloroethene, trans-1,2-Dichloroethene, cis-1,2-Dichloroethene, Cyclohexane, Trichloroethene, Methylcyclohexane, 1,2-Dichloropropane, Bromodichloromethane, Toluene, Tetrachloroethene, Ethylbenzene, o-Xylene, m,p-Xylene, Styrene, Isopropylbenzene

E4KQ9DL

Cyclohexane, Benzene, Trichloroethene, Methylcyclohexane, 1,2-Dichloropropane, Bromodichloromethane, Toluene, Tetrachloroethene, Ethylbenzene, o-Xylene, m,p-Xylene, Styrene, Isopropylbenzene

The following volatile samples have DMC/SMC recoveries above the upper limit of the criteria window. Detected compounds are qualified "J". Non-detected compounds are not qualified for this criterion. Some non-detects are ultimately qualified as "UJ" because not all calibration criteria was met.

Case Number: 42622  
Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP0  
Laboratory: Spectrum Anal. - PEL

E4KP6  
Vinyl Chloride

E4KP8, E4KQ2  
4-Methyl-2-pentanone, 2-Hexanone

E4KQ1DL  
Trichlorofluoromethane, 1,1-Dichloroethene, 1,1,2-Trichloro-1,2,2,-trifluoroethane,  
Methyl Acetate, Methylene Chloride, trans-1,2-Dichloroethene,  
Methyl tert-Butyl Ether, 1,1-Dichloroethane, cis-1,2-Dichloroethene,  
Bromochloromethane, Chloroform, 1,1,1-Trichloroethane, Carbon Tetrachloride,  
1,2-Dichloroethane, Dibromochloromethane, 1,2-Dibromoethane, Bromoform

E4KQ2DL  
Trichlorofluoromethane, 1,1-Dichloroethene, 1,1,2-Trichloro-1,2,2,-trifluoroethane,  
Methyl Acetate, Methylene Chloride, trans-1,2-Dichloroethene,  
Methyl tert-Butyl Ether, cis-1,2-Dichloroethene, 1,1,1-Trichloroethane,  
Carbon Tetrachloride, 1,2-Dichloroethane, 1,2-Dibromoethane

#### **6A. MATRIX SPIKE/MATRIX SPIKE DUPLICATE**

Sample E4KP1 was designated by the samplers to be used for laboratory QC, i.e. MS / MSD analyses.

The relative percent difference (RPD) between the following volatile matrix spike and matrix spike duplicate recoveries is outside criteria. The compounds were not detected in the unspiked sample. Non-detected compounds in the unspiked sample (E4KP1) are qualified "UJ".

E4KP1MS, E4KP1MSD  
1,1-Dichloroethene, Benzene, Toluene

#### **6B. LABORATORY CONTROL SAMPLE**

No problems were found.

#### **7. FIELD BLANK AND FIELD DUPLICATE**

Sample E4KQ6 was identified as equipment blank. Results for the equipment blank are summarized in the following table:

Analytes	QC ID	equipment blank
	Sample ID	E4KQ6
	DF, units	1, ug/L
Acetone		1.6
TIC - Phenol, 2,4-bis(1,1-dimethylethyl)-		7.5

Samples E4KQ1/E4KQ2 and E4KQ3/E4KQ5 are the field duplicate pairs. Results for the duplicate samples are summarized in the following tables:

Analytes	Sample ID	E4KQ1	E4KQ2	RPDs	E4KQ1DL	E4KQ2DL	RPDs
	DF, units	1, ug/L	1, ug/L		2, ug/L	2, ug/L	
1,1,2-Trichloro-1,2,2-trifluoroethane		0.34	0.27	23	ND	ND	0
cis-1,2-Dichloroethene		2.5	2.8	11	2.9	2.9	0
Trichloroethene		27	29	7.1	29	29	0
VOA TICs		1	0		0	0	

Analytes	Sample ID	E4KQ3	E4KQ5	RPDs	E4KQ3DL
	DF, units	1, ug/L	1, ug/L		1, ug/L
Vinyl chloride		400	470	16	410
cis-1,2-Dichloroethene		140	210	40	200

Results are not qualified based upon the results of the field duplicates.

## 8. INTERNAL STANDARDS

The following trace volatile samples have internal standard area counts that are outside the lower limit of primary criteria. Detected compounds are qualified "J". Non-detected compounds are qualified "R".

### E4KQ2DL

Bromoform, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichlorobenzene, 1,2-Dibromo-3-chloropropane, 1,2,4-Trichlorobenzene, 1,2,3-Trichlorobenzene

Case Number: 42622  
Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP0  
Laboratory: Spectrum Anal. - PEL

E4KQ9

Dichlorodifluoromethane, Chloromethane, Vinyl chloride, Bromomethane, Chloroethane, Trichlorofluoromethane, 1,1-Dichloroethene, 1,1,2-Trichloro-1,2,2-trifluoroethane, Acetone, Carbon disulfide, Methyl acetate, Methylene chloride, trans-1,2-Dichloroethene, Methyl tert-butyl ether, 1,1-Dichloroethane, cis-1,2-Dichloroethene, 2-Butanone, Bromochloromethane, Chloroform, 1,1,1-Trichloroethane, Cyclohexane, Carbon tetrachloride, Benzene, 1,2-Dichloroethane, Trichloroethene, Methylcyclohexane, 1,2-Dichloropropane, Bromodichloromethane, cis-1,3-Dichloropropene, 4-Methyl-2-pentanone, Toluene, trans-1,3-Dichloropropene, 1,1,2-Trichloroethane, Tetrachloroethene, 2-Hexanone, Dibromochloromethane, 1,2-Dibromoethane, Chlorobenzene, Ethylbenzene, o-Xylene, m,p-Xylene, Styrene, Bromoform, Isopropylbenzene, 1,1,2,2-Tetrachloroethane, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,2-Dichlorobenzene, 1,2-Dibromo-3-chloropropane, 1,2,4-Trichlorobenzene, 1,2,3-Trichlorobenzene

## 9. COMPOUND IDENTIFICATION

After reviewing the mass spectra and chromatograms it appears that all volatile and aroclor compounds were properly identified.

## 10. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS

The following volatile samples have compound concentrations less than the CRQL. Detected compounds are qualified "J".

E4KP0, E4KP1  
trans-1,2-Dichloroethene

E4KP1DL, E4KQ0DL  
Chloromethane

E4KP2  
cis-1,2-Dichloroethene

E4KP3  
Trichloroethene, Tetrachloroethene

E4KP5  
2-Butanone, Trichloroethene

E4KP9, E4KP9DL  
Toluene

E4KQ0DL2  
Tetrachloroethene

Case Number: 42622  
 Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP0  
 Laboratory: Spectrum Anal. - PEL

E4KQ1, E4KQ2  
 1,1,2-Trichloro-1,2,2-trifluoroethane

E4KQ4  
 Trichloroethene

E4KQ6, VBLK1D, VBLK1G  
 Acetone

E4KQ8RE, VBLK1A  
 Methylene chloride

E4KQ9DL  
 trans-1,2-Dichloroethene, 1,2-Dichlorobenzene

VBLK1B  
 Acetone, Methylene chloride

A library search indicates a match above 85% for a TIC compound in the following volatile samples. Detected compounds are qualified "NJ".

CAS No. 96-76-4	Phenol, 2,4-bis(1,1-dimethylethyl)-
E4KQ6	

CAS No. 115-07-1	Propylene;
CAS No. 142-29-0	Cyclopentene;
CAS No. 352-93-2	Diethyl sulfide
E4KQ9, E4KQ9DL	

CAS No. 3302-10-1	Hexanoic acid, 3,5,5-trimethyl-;
CAS No. 18641-71-9	3-Heptanone, 2,4-dimethyl-
E4KP5	

CAS No. 7446-09-5	Sulfur dioxide
E4KP6, E4KQ0, E4KQ1, E4KQ9DL	

CAS No. 7642-09-3	3-Hexene, (Z)-;
CAS No. 107-00-6	1-Butyne;
CAS No. 110-02-1	Thiophene;
CAS No. 67061-30-7	3,3-Dimethylheptanoic acid
E4KQ9	

A library search indicates a match below 85% for a TIC compound in the following volatile samples. Detected compounds are qualified "J".

Case Number: 42622

SDG Number: E4KP0

Site Name: Outboard Marine Corporation (IL)

Laboratory: Spectrum Anal. - PEL

Unknown @ 1.35;    Unknown @ 1.99;    Unknown @ 2.61;    Unknown @ 3.78;  
Unknown @ 4.10;    Unknown @ 4.47;    Unknown @ 8.33;    Unknown @ 11.90  
E4KQ9

Unknown @ 1.58;    Unknown @ 1.66  
E4KQ9, E4KQ9DL

Unknown @ 2.29;    Unknown @ 2.42  
E4KQ9DL

Unknown @ 8.73  
E4KP6

Unknown @ 8.91;    Unknown @ 11.35  
E4KP5, E4KP6

Unknown @ 9.01;    Unknown @ 10.12;    Unknown @ 10.28;    Unknown @ 10.34;  
Unknown @ 10.42;    Unknown @ 10.48;    Unknown @ 10.59;    Unknown @ 10.81;  
Unknown @ 11.39;    Unknown @ 11.49;    Unknown @ 11.59;    Unknown @ 11.62  
E4KP5

Unknown @ 11.65;    Unknown @ 12.25  
E4KP5, E4KP6, E4KP7

Unknown @ 11.90 - 11.92;    Unknown @ 12.15  
E4KP5, E4KP6, E4KP7, E4KP8

Unknown @ 11.93 - 11.95;    Unknown @ 12.13  
E4KP5, E4KP6, E4KP7, E4KP8, E4KQ0, E4KQ9

Unknown @ 12.02 - 12.04  
E4KP5, E4KP6, E4KP7, E4KP8, E4KQ9

Unknown @ 12.05  
E4KP7, E4KP8, E4KQ9

Unknown @ 12.09 - 12.11  
E4KP7, E4KP8, E4KQ0, E4KQ9

Unknown @ 12.28;    Unknown @ 12.33;    Unknown @ 12.38;    Unknown @ 12.43;  
Unknown @ 12.47;    Unknown @ 12.53  
E4KP7

The following aroclor samples have compound concentrations less than the CRQL. Detected compounds are qualified "J".

Case Number: 42622  
Site Name: Outboard Marine Corporation (IL)

Page 12 of 14  
SDG Number: E4KP0  
Laboratory: Spectrum Anal. - PEL

ALCS4B  
Aroclor-1016

#### 11. SYSTEM PERFORMANCE

GC/MS baseline indicated acceptable performance. The GC baselines for the aroclor analyses were acceptable.

#### 12. ADDITIONAL INFORMATION

EXES did not include the following aroclor sample. Form Is for this sample is included with the hard copy data package.

ALCS4B

The following volatile samples have compound concentrations which exceed the instruments calibration range. The detected results are qualified "J".

E4KP0, E4KP1, E4KQ9  
cis-1,2-Dichloroethene

E4KP4, E4KQ1, E4KQ2  
Trichloroethene

E4KP7, E4KP9  
Benzene

E4KQ3  
Vinyl chloride, cis-1,2-Dichloroethene

The following undiluted and diluted volatile samples have compound concentrations which exceed the instruments calibration range. The detected results are qualified "J". The results from the second diluted analysis (E4KQ0DL2) should be considered the final concentrations for the affected compounds even though it was analyzed outside the holding time.

E4KQ0, E4KQ0DL  
cis-1,2-Dichloroethene

The following volatile samples have compound concentrations which exceed the instruments calibration range. The detected results are qualified "J".

E4KP1MS, E4KP1MSD  
cis-1,2-Dichloroethene

Case Number: 42622  
Site Name: Outboard Marine Corporation (IL)

SDG Number: E4KP0  
Laboratory: Spectrum Anal. - PEL

The following volatile samples have a compound identified by CAS No. in some samples and as an Unknown TIC in other samples. A comparison of the chromatograms demonstrated that the compounds are most probably the same chemical. Copies of the chromatograms are included with the hardcopy data validation package.

CAS No. 7446-09-5 Sulfur dioxide

E4KQ1, E4KQ9DL

Versus

Unknown @ 1.350-1.379

E4KP6, E4KQ0

The following volatile samples have an alkane compound, (straight chain, branched, or cyclic), improperly reported as a TIC on the Form I VOA-TIC. The individual TICs were removed from the Form Is and qualified as non-reportable in EXES. Copies of the chromatograms are included with the hardcopy data validation package.

CAS No. 109-66-0 Pentane

CAS No. 6142-73-0 Methylenecyclopropane

E4KQ9

CAS No. 1191-96-4 Cyclopropane, ethyl- / Unknown @ 2.206

E4KQ9, E4KQ9DL

CAS No. 930-18-7 Cyclopropane, 1,2-dimethyl- / Unknown @ 2.422

E4KQ9, E4KQ9DL

Case Number: 42622  
Site Name: Outboard Marine Corporation (IL)

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SDG Number: E4KP0  
Laboratory: Spectrum Anal. - PEL

CADRE Data Qualifier Sheet

<u>Qualifiers</u>	<u>Data Qualifier Definitions</u>
U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is an approximate concentration of the analyte in the sample.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the action limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification.
NJ	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification and the associated numerical value represents its approximate concentration.
R	The data are unusable. (The compound may or may not be present.)

Appendix E  
Geotextile Data Sheet

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**GEOTEX 350ST** is a woven polypropylene geotextile containing heavy woven tape/fibrillated yarns produced by Propex, and will meet the following Minimum Average Roll Values (MARV) when tested in accordance with the methods listed below. These characteristics make **GEOTEX 350ST** ideal for the construction of embankments over soft soils, steepened slopes, and modular block and/or wrapped-face retaining walls. The geotextile is resistant to ultraviolet degradation and to biological and chemical environments for normally found in soils.

**GEOTEX 350ST** conforms to the property values listed below<sup>1</sup>, as well as meets the requirements set forth by AASHTO M-288/NTPEP (Geotextile Specification for Highway Application). Propex performs internal Manufacturing Quality Control (MQC) tests that have been accredited by the Geosynthetic Accreditation Institute – Laboratory Accreditation Program (GAILAP).

MARV<sup>2</sup>

PROPERTY	TEST METHOD	ENGLISH	METRIC
<b>ORIGIN OF MATERIALS</b>			
% U.S. Manufactured Inputs		100%	100%
% U.S. Manufactured		100%	100%
<b>MECHANICAL</b>			
Tensile Strength (Grab)	ASTM D-4632	450 x 350 lbs	2002 x 1557 N
Elongation	ASTM D-4632	15%	15 %
Wide Width Tensile	ASTM D-4595	3600 x 3240 lbs/ft	52.6 x 47.3 kN/m
Wide Width Elongation	ASTM D-4595	8%	8%
Wide Width Tensile at 5% Strain	ASTM D-4595	1356 lbs/ft	19.8 kN/m
CBR Puncture	ASTM D-6241	1200 lbs	5340 N
Trapezoidal Tear	ASTM D-4533	130 lbs	578.5 N
<b>ENDURANCE</b>			
UV Resistance % Retained at 500 hrs	ASTM D-4355	70%	70%
<b>HYDRAULIC</b>			
Apparent Opening Size (AOS) <sup>3</sup>	ASTM D-4751	30 US Std. Sieve	0.600 mm
Permittivity	ASTM D-4491	0.3 sec <sup>-1</sup>	0.3 sec <sup>-1</sup>
Water Flow Rate	ASTM D-4491	20 gpm/ft <sup>2</sup>	815 lpm/m <sup>2</sup>
<b>ROLL SIZES</b>		15.0 ft x 300 ft 12.5 ft x 300 ft	4.6 m x 91.5 m 3.8 m x 91.5m

**NOTES:**

1. The property values listed above are effective 04/2011 and are subject to change without notice.
2. Values shown are in weaker principal direction. Minimum average roll values (MARV) are calculated as the typical minus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any samples taken from quality assurance testing will exceed the value reported.
3. Maximum average roll value.



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Propex Operating Company, LLC · 6025 Lee Highway, Suite 425 · PO Box 22788 · Chattanooga, TN 37422

ph 423 899 0444 · ph 800 621 1273 · fax 423 899 7619

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